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DISEASES CAUSED BY BACTERIA AND FUNGI.

WALL, Sven. (1931). Nötkreaturstuberkulosens utbredning i Sverige länsvis under åren 1918-1929 jämförd med människotuberkulosens utbredning i riket under åren 1911-1929. [**The Incidence of Bovine Tuberculosis in Swedish Provinces between 1918 and 1929 Compared with that of Human Tuberculosis between 1911 and 1929**]. *Skand. Vet-tidskr.* 21. 121-173. 14 tables. 4 maps.

The author has based his calculations on the percentages of the cattle which were found to be tuberculous after slaughter at the several state abattoirs, in most of which a full veterinary examination is compulsory. Over the years mentioned (1918 to 1929), statistics are available for practically the whole country and the far-reaching results of the survey are shown on maps, a system of shading being used. The figures given only concern the adult cattle which were slaughtered; no information is provided concerning young stock or other farm animals. At present, bovine tuberculosis is most prevalent in 3 provinces near Stockholm but it is increasing in the whole country, being commoner in the south than in the north. The incidence of human tuberculosis is decreasing, particularly towards the south and it is most prevalent in the northernmost province. On the other hand, during 1920-21, tuberculosis of infants was highest in Stockholm province and in Malmöhus (the southernmost province). This corresponded roughly with the occurrence of tuberculous mastitis in cattle. During these two years, about 30 per cent. of the cases of infantile tuberculosis were found to be due to this source of infection. This study shows that bovine and human tuberculosis do not tend to develop parallel with each other and that, apart from bovine tubercle infection in children, they have very little connection.

JERLOV, S. (1930). Die Klinischen Untersuchungen als Ergänzung zur Tuberculinprobe bei der Bangschen Methode. [**Clinical Examinations as the Complement to Tuberculin Tests in Bang's Method.**] *Zeitschr. Infektkr.* 37. 29-39.

In the first part of this paper the author gives detailed accounts of his examination of 401 animals affected with "open" tuberculosis of the lungs and reviews the clinical examinations he made of infected animals on farms which were practising Bang's method of eradication. He gives details of the animals on 9 farms and of the tuberculin tests carried out.

Improvement in methods of diagnosis is an urgent necessity. Bang realised this for, in his first publication on the methods of attacking tuberculosis, he stated that tuberculin does not invariably reveal the presence of the disease. This has been confirmed over and over again and the imperfection of tuberculin as a means of detecting tuberculosis has, particularly in the case of valuable herds, sometimes resulted not only in disappointment but in the expenditure of large sums of money without adequate return.

Tuberculin may fail to cause reactions in infected animals for a variety of reasons. The explanation of the failures is not a major consideration, but from the point of view of control the failures themselves are important. The author has formed the opinion that the occurrence of reactors in herds which have been free from the disease for a long time, as indicated by the results of tests, is due to the introduction of animals which have been in contact with infected animals and have contracted an infection which remains latent. For some reason such latent infections become active and the disease is spread to other animals. Cases of this kind are referred to in the first part of the paper.

In carrying out his clinical examinations of animals, JERLOV follows closely the technique described by VON OSTERTAG. He pays great attention to animals which cough and are in poor condition and subjects them to a special examination. He finds that auscultation is of greater value than percussion, but admits that his percussion technique may be faulty. The use, either for microscopical examination or for inoculation, of sputum obtained by making the suspected animals cough, is a valuable means of diagnosis. In 333 cases out of 401 the author was able to make the animals cough by closing the nostrils. Experience, coupled with *post-mortem* examinations, is essential for the proper appreciation and interpretation of the sounds heard by auscultation.

SCHIEL, Otto. (1931). Beitrag zur Intensivierung des Tuberkulose-bekämpfungsverfahrens. [A Contribution to the Intensification of the Campaign against Tuberculosis.] *Berlin. tierärztl. Wschr.* 47. 137-138.

Owing to economic considerations, Ostertag's plan for the control of tuberculosis has been adopted in Germany. It has been recognised, however, that a single clinical examination, as practised, is quite inadequate. Since only infected herds are subjected to a second examination, the author considered that this should be supplemented by a bacteriological examination of the bronchial secretion of all the animals dealt with. He carried out this procedure with satisfactory results on two herds. He recommends that it be made a routine measure provided that the additional diagnostic work will not embarrass the existing bacteriological institutes.

MYERS, J. Arthur. (1931). Newer Aspects of the Prevention of Tuberculosis. *J. Amer. Vet. Med. Ass.* 78. 385-399.

In the course of colonisation man has disseminated the human tubercle bacillus throughout the world; similarly, the disease has been introduced into countries previously free from animal tuberculosis, by the importation of livestock. In the light of our present knowledge people must co-operate with veterinary and medical workers in an effort to eradicate the disease and to prevent it from reappearing. Promising results have already been obtained in children and in cattle as a result of pasteurisation methods and of intensive tuberculin testing of dairy herds.

The author points out that the recent adoption, in the United States, of area tuberculin testing in children as introduced in 1915, promises to be of great assistance, not only as a diagnostic measure, but also as a method of tracking down sources of infection.

SCHIEL, Otto. (1931). Tuberkulose der Schädelbasisknochen bei einem Jungrind. [Tuberculosis of the Bones of the Base of the Cranium in a Young Bovine]. *Deuts. tierärztl. Wschr.* 39. 101-102.

The case described occurred in an animal about 15 months old which showed symptoms referable to a lesion involving the brain.

On *post-mortem* examination, a tubercle as large as a walnut was found in the left bronchial gland, but no other lesions were found in any of the body glands or organs. The author divided the head mesially and found a tuberculous lesion involving the anterior third of the occipital bone and two-thirds of the sphenoids; there were small tubercles embedded in the spongy bone tissue. Pressure was probably exerted on the oculo-motor, trochlear, abducens and trigeminus nerve supplies. Both parents of the animal were free from tuberculosis.

BOQUET, A., & VALTIS, J. (1931). Sur l'infection tuberculeuse paucibacillaire du cobaye. [**The Infection of the Guinea Pig with minimal Doses of Tubercle Bacilli**]. *C.R. Soc. Biol. Paris*. 106. 250-253. [2 refs.]

The authors have attempted to determine whether, by injecting guinea pigs with minimal doses of tubercle bacilli by any path other than into the blood stream, it is possible to produce a non-progressive infection comparable to the latent or occult forms which are common in man and animals.

The problem is of theoretical and practical interest from the points of view of the general mechanism of primary infection, of the pathogenesis of the various clinical manifestations of the disease and of immunity, allergy and anti-bacillary therapeutics.

The results of two sets of experiments are given:—(a) infection of guinea pigs with 0.0000025 mg. of bacilli in 0.2 c.c. of saline injected into the trachea and (b) the same dose injected subcutaneously under the pad of a hind leg.

The guinea pigs were killed at intervals ranging from 6 hours to 36 days after inoculation. Emulsions of the lungs, liver, spleen and broncho-tracheal glands in the case of the animals of group (a), and of the spleen, lungs, popliteal, inguinal, sublumbar and broncho-tracheal glands in the case of those of group (b), were injected subcutaneously into other guinea pigs.

Data were obtained in relation to the following questions:—whether, on injection into the trachea or into the plantar connective tissue, the bacilli appear to spread solely by way of the lymphatic vessels and whether, during this phase, the infection is strictly confined to the associated glands. This is a primary complex and its development depends upon the permeability of the tissues to the bacilli present, on the structure of the tissues and their physiological activity, the abundance of leucocytes, particularly monocytes, and on the richness of the lymph and blood capillaries. These factors explain why the tracheo-bronchial glands arrest the bacilli for a shorter time than the popliteal and inguinal glands when exposed to repeated infection and extensive invasion. The relatively early invasion of the blood in primary pulmonary infection may be attributed to the fact that there is only one glandular obstruction between the centres of infection and the venous circulation.

In addition to the multiplication of the bacilli and the development of specific lesions at the seat of inoculation and in the associated glands, infection with tubercle bacilli causes other phenomena. As a result of the action of substances produced by disintegration of the bacilli and by the tissues which have become altered in function, the animal body gradually becomes more and more susceptible to the bacillary proteins and acquires the power of resisting super-infections of an homologous type. Consequently, when the bacilli have passed the barrier formed by the glands and have been distributed by the blood stream, the majority of them are destroyed or eliminated. Those which escape local allergic reactions form fresh lesions which either die out or extend. In these circumstances, although the viscera are simultaneously invaded as a result of bacillæmia, experimental tuberculosis in the guinea-pig tends to acquire the chronic or slowly progressive characters of phthisis. From the tabular results of the experiments in groups (a) and (b) mentioned above, the following information may be gathered.

GROUP (a).

Tubercle bacilli were present in the lungs 6 hours after inoculation, in the bronchial gland after 6 days and in the liver and spleen after 17 days.

GROUP (b).

With two exceptions, the bacilli were confined to the popliteal glands until after the 24th day. In one case they were detected by the test inoculations in the sublumbar glands on the 14th day and, in one instance, in the spleen on the 21st day.

At the 35th day the test inoculations revealed their presence in all the organs examined.

BOQUET, A., & VALTIS, J. (1931). Sur l'infection tuberculeuse ganglionnaire du cobaye. [**Tuberculous Adenitis in the Guinea Pig**]. *C.R. Soc. Biol. Paris*. 106. 68-70. [5 refs.]

The authors performed some experiments on guinea pigs to demonstrate the effect of the surgical removal of the site of infection at varying periods of time after intradermal inoculation with tubercle bacilli. By this method they succeeded in producing tuberculous infection in three guinea pigs which, after 3 or 4 months, was still confined to the lymphatic glands of the inoculated region although

control guinea pigs died of generalised tuberculosis. The lesions in the affected glands were comparable to those set up by CALMETTE, GUERIN, and GRYZEY by conjunctival instillation and also to those met with in tuberculous lymphadenitis in children and adolescents.

The authors conclude that the degree and type of infection produced is dependent to some extent on the continued emission of bacilli from the focus of inoculation.

BOQUET, A., & VALTIS, J. (1931). Sur la dispersion des bacilles tuberculeux d'épreuve dans l'organisme des cobayes allergiques. [**The Dispersion of Test Injections of Tubercle Bacilli in Guinea Pigs in a Condition of Allergy**]. *C.R. Soc. Biol. Paris*. 106. 253-256. [6 refs.]

The term "allergy" was coined by PIRQUET to define a condition in human beings and the majority of mammals which results from infection with tubercle bacilli. The condition is characterised by two physiological modifications, namely, (1) a hypersensitiveness to the bacterial proteins which develops after a delay, depending upon the dose and virulence of the organisms absorbed and (2) a gradually increasing power of resistance to superinfection.

The relationship between hypersensitiveness and immunity is so close that, according to some authors, the two conditions are simply different aspects of the same thing. According to KRAUSE, anti-tuberculous immunity is a consequence or function of hypersensitiveness in the sense that local reactions, produced by dermal or subcutaneous superinfections, delay the dispersion of bacilli injected as tests.

In normal guinea pigs the bacilli can be found in the neighbouring glands within an hour of injection and they pass rapidly *via* the lymphatics to the blood stream which they reach by the third or fourth day. In guinea pigs, in the allergic state, test bacilli remain for about a week at the seat of inoculation and only spread by the lymphatic system and blood stream about 3 or 4 weeks after the inoculation.

The authors inoculated guinea pigs subcutaneously with BCG and with Brown's bacillus R and then injected virulent bacilli subcutaneously into one of the hind pads. The guinea pigs were killed at varying intervals and materials taken from them were used for the inoculation of fresh guinea pigs.

Tabular statements of experiments are given and the results may be summarised as follows:—when small doses of virulent bacilli are injected subcutaneously into guinea pigs which have previously received a large dose of BCG or bacillus R, they remain confined to the neighbourhood of the seat of inoculation for at least 6 days and the period is inversely proportional to the number of bacilli contained in the test inoculation. But where the re-infection is carried out with large doses, this does not hold good, the bacilli being disseminated immediately. While the retention of the bacilli *in situ* and in the succession of glands may, to a certain extent, be attributed to the inflammatory reaction they produce, it cannot be inferred that they are solely responsible for anti-tuberculous immunity. The immunity reaction is a specific one; there is a prompt reaction due to hypersensitiveness which is transient and its importance is out of proportion to the associated immunity. This is followed by a progressive, prolonged, follicular reaction which results in the partial or complete, temporary or permanent, blockage of the bacilli.

LOEWENSTEIN, E. (1931). Die Züchtung der Tuberkelbazillen aus dem strömenden Blute. [**Cultivation of *Mycobacterium tuberculosis* from the Blood Stream**]. *Zlb. Bakt. (Orig.)* 120. 127-129. [17 refs.]

The author elaborated a practicable method for isolating *Myc. tuberculosis* of avian origin from the blood stream of rabbits, guinea pigs, cats and hens. He used a special medium containing asparagin and gives details concerning its preparation. On this medium he always obtained positive results with blood cultures. He observed that some cultures, isolated directly from human blood, formed colonies on this medium resembling those of the avian type.

VAN ES, L. (1931). Remarks on Avian Tuberculosis Infection in Mammals. *J. Amer. Vet. Med. Ass.* 78. 371-378.

The author gives an account of the results obtained from the final experiments of an investigation

which was commenced in 1923 to study the importance of avian tuberculous infection in cattle and human beings.

Out of 105 cases in domesticated birds, 104 were of the avian type and one was of a mixed type.

In 58 cases of generalised tuberculosis in cattle, the strains obtained were all of the bovine type. Negative results were obtained in the examination of 39 hæmorrhagic lymph-nodes and of 5 pregnant uteri from positively reacting cattle free from tuberculous lesions. Acid-fast bacilli were present in 36 out of 40 bovine tuberculous skin lesions but typing experiments could not be carried out because the bacilli present in the lesions were apparently dead as pigs remained healthy after feeding on large quantities of the diseased tissues. Of the bacilli present in material from 115 isolated lesions in cattle, 100 were of the mammalian, 11 of the avian and 4 of mixed types; 6 out of the 11 cattle affected with the avian type were reactors to the tuberculin test.

227 lesions were typed from human cases, including 8 generalised cases, 44 bone and joint cases, 99 kidney cases, 25 cases of tuberculous lymphadenitis, 13 cases in which bacilli were present in cerebro-spinal fluid, and 11 tuberculous abscesses. 217 strains of the human, 9 strains of the bovine, and one undetermined type were obtained; this last strain was not classified but it was definitely not of the avian type. The author considers that the eradication campaign in dairy herds may be in part responsible for the low incidence of bovine infection in these extra-pulmonary cases and supports his view by pointing out that, although 40 per cent. of the material examined was from children of less than 15 years of age, only two bovine infections occurred in this group. The kidney in man is apparently a predilection seat for the bovine bacillus as 6 out of the 9 bovine types were obtained from kidney lesions.

It is concluded that the avian bacillus is of considerable importance to cattle and may influence the tuberculin test; this point needs further inquiry. Avian tuberculosis does not seem to be of great importance to human beings in the United States.

FELDMAN, W. H. (1931). **The Pathological Changes following Experimental Exposure of Dogs to *Mycobacterium tuberculosis* of Avian Origin.** *Amer. J. Path.* **7**. 147-155. [5 refs.]

Dogs appear to be resistant to the common methods of inoculation with avian tubercle bacilli and the author only succeeded in producing macroscopic lesions by intracerebral inoculation; dogs inoculated in this way died within 4 weeks and at autopsy there was acute meningo-encephalitis and hepatitis. No other organs were affected; the lesions in the liver and central nervous system were only manifested by a rather intense monocytic reaction and acid-fast bacilli were obtainable from them.

SCHALK, A. F. (1931). **Avian Tuberculosis.** *J. Amer. Vet. Med. Ass.* **78**. 437-445.

The author gives a brief account of the results of recent research work on avian tuberculosis and their effect upon future methods of control and eradication.

Less than one per cent. of the eggs from tuberculous fowls are infected with the bacillus, but presumably these eggs are not hatchable as it is stated that the disease is not egg-transmitted. Contaminated soil may remain infected for two years and it is claimed that pigeons, sparrows, and rats are mechanical carriers of the disease. The majority of the cases of tuberculosis in swine [in the U.S.A.] are of avian origin and, although avian infection does occur in cattle, it is usually only mild and localised. A very slight infection will sensitise cattle to avian tuberculin.

The disease is enzootic in the United States, but the author concludes that, if sufficient interest were aroused and sufficient money were obtainable, as successful a campaign could be carried out against avian tuberculosis as the one now in operation for the eradication of bovine tuberculosis.

WILSON, J. E. (1931). **Some Remarks on Avian Tuberculosis and its Diagnosis by means of the Intradermal Tuberculin Test.** *Vet. Rec.* **11**. 406.

When applying the tuberculin test, the author injects 0.2 c.c. of avian tuberculin intradermally into the skin of the wattle. He regards any appreciable thickening after 24 hrs. as a positive reaction.

FELDMAN, William H. (1931). **A Modification of the Medium of Sweany and Evanoff for Culturing the Organism of Bovine Tuberculosis.** *J. Amer. Vet. Med. Ass.* **78.** 527-530. [6 refs.].

The method adopted by SWEANY and EVANOFF for cultivating bovine tubercle bacilli obviates the necessity for an initial passage of the material through guinea pigs. Their medium consists of a filtrate of finely minced veal soaked overnight in sterile milk, cream and eggs being added. FELDMANN found difficulty in obtaining enough filtrate so he made the following alterations in the method:—he soaked 250 g. of freshly minced lean steak in 100 c.c. of distilled water in the ice chest, autoclaved it next morning for 30 mins. at a pressure of 15 lbs. per sq. inch and, to 100 c.c. of autoclaved meat broth, he added 50 c.c. of sterile whole milk, the same amount of sterile standard cream and eggs equal to twice the weight of the whole mixture.

This mixture was thoroughly stirred and strained and then tubed to make slants. The tubes and their contents were carefully sterilised progressively by moist heat for 4 days and were incubated at 37° C. for 2 or 3 days before use.

The author has used this medium for over a year for the direct cultivation of bovine tubercle bacilli from cattle and other animals and prefers it to any other method. He gives an account of the results which he has obtained with it.

SABIN, Florence R., MILLER, Franklin R., DOAN, Charles A., & WISEMAN, Bruce K. (1931). **A Study of the Toxic Properties of Tuberculo-proteins and Polysaccharides.** *J. Exp. Med.* **53.** 51-80. 5 tables, 8 charts. [25 refs.].

The authors have carried out a number of experiments to demonstrate the effect of inoculating tuberculo-proteins and polysaccharides into guinea pigs and rabbits infected experimentally with tuberculosis.

The injection into guinea pigs of 2.5 mg. or more of tuberculo-protein proved fatal in every case and the killing power was consistently related to the dosage. The polysaccharides were neither so potent nor so consistent in their effects. Two types of temperature reaction were observed; in one type there was a fall preceding death and in the other type the animal survived after showing a reaction. As a result of titration experiments with the two substances, the authors conclude that the temperature reaction following injection of the polysaccharides is probably due to the contaminating protein they contain. Similar results were obtained with rabbits.

Both protein and polysaccharide inoculations caused changes in the white blood cells.

NÉLIS, P., & PICARD, E. (1931). Contribution à l'étude de l'innocuité du bacille BCG pour le cobaye grévade. Recherches des éléments filtrables. [The Harmlessness of BCG for the pregnant Guinea Pig. Research on the Filtrability of the Bacilli.] *Ann. Inst. Pasteur.* **46.** 27-51. [2 refs.].

The authors describe a series of 10 experiments carried out to study the effect of massive doses of BCG vaccine on pregnant guinea pigs and to determine whether a filtrable form of the BCG strain passes to the fetus. The doses varied between 40 and 150 mg. and the average period of observation was 1-1½ years. A thorough examination of the pus obtained from abscesses formed at the sites of inoculation was carried out; the parents and offspring were also examined after death. The results of microscopical examinations were supported by inoculations, sometimes through more than one series of animals.

Acid-fast bacilli were detected in the parent only in the pus at the site of inoculation; no tuberculous lesions were found in the parents, in the offspring or in the re-inoculated guinea pigs. Intradermal tuberculin tests gave positive results only in guinea pigs inoculated with BCG vaccine or with pus rich in bacilli. The administration of massive doses of the vaccine were followed occasionally by abortion but this was not peculiar to infection with the BCG culture.

The results of a series of experiments demonstrated that inflammatory lesions sometimes found in the lungs occurred after treatment with non-bacillary material, such as tapioca injected subcutaneously or lead administered *per os*.

DREYER, Georges, & VOLLUM, R. L. (1931). **Mutation and Pathogenicity Experiments with BCG.** *Lancet*. 220. 9-14. 1 plate. [10 refs.]

The pathogenic properties of two strains of BCG were investigated. Deep bouillon subcultures of BCG (1) produced generalised tuberculosis in 28 guinea pigs which were inoculated intraperitoneally with doses of 0.1 to 20 mg., and they produced severe progressive tuberculous lesions in all of 12 rabbits inoculated intravenously with doses of 5 to 50 mg. 22 out of 23 guinea pigs, infected either directly with tuberculous material from these animals or with cultures from the material, developed generalised tuberculosis. *B. tuberculosis* was found in cultures from the heart blood of all of the 28 guinea pigs injected directly with deep cultures of BCG (1), and in 19 out of 23 guinea pigs infected with pathological material or cultures obtained from the animals originally infected with this material.

The pathogenicity of BCG 359 was tested on guinea pigs. Out of 20 guinea pigs which were injected with the culture as received from the Pasteur Institute, one died from an unknown cause 672 days after an intraperitoneal dose of 5 mg.; caseous tuberculous lesions which showed no signs of healing were present in the right testis and in the left epididymis. Deep bouillon sub-cultures of this strain were tested on 56 guinea pigs; out of 12 which received doses of 10 mg. intraperitoneally, 3 were killed and 2 died. 4 of these 5 animals had caseous abscesses in the testes or epididymes and all of them showed definite progressive tuberculous lesions.

From these experiments it is apparent that, under certain comparatively simple cultural conditions, BCG may at times develop a relatively high degree of virulence for laboratory animals. At present, the authors cannot say exactly what factors in the medium or in the conditions of culture are responsible for bringing about this mutation phenomenon. It is very important that the animals should be kept under observation for a period, not of months but of years, as a prolonged latent stage in an apparently benign infection cannot be taken as a criterion of the final outcome. Accordingly, all surviving animals infected with BCG 359 are being kept under observation and a report will be made later.

— (1931). **BCG at the Paris Academy of Medicine.** *Lancet*. 220. 308.

At the meeting of the Academy on January 20th, Professor J. LIGNIÈRES of Buenos Aires made an attack on the alleged innocuity of the BCG vaccine.

He remarked that, if the vaccine was judged on contemporary medical and lay comments, it might be thought that its efficacy had been generally accepted. That was not, however, correct and at no congress had a vote been taken on the merits of the vaccine.

He objected to the employment by CALMETTE of the total figures of infantile mortality; the report from Roumania of a reduction in infantile mortality from 25 to 2.3 per cent. could not be accepted.

Evidence was gradually accumulating to show that the BCG strain was not definitely fixed. The results of DREYER and VOLLUM confirmed those of PETROFF; LIGNIÈRES himself had found that, by the addition of egg to the medium, some cultures could be exalted in virulence to the point of producing progressive tuberculous lesions in guinea pigs. Subcultivation of these strains on the egg medium did not, however, produce any further increase in virulence and some of the guinea pigs which were inoculated from them recovered.

He admitted that CALMETTE and the German workers were perfectly correct in their claims that the classical BCG vaccine was not responsible for the Lübeck disaster. It would appear, however, from information obtained at the Lübeck laboratory, that the vaccine had possibly been grown on media containing egg. If this was confirmed, it might explain the cause of the tragedy.

HORMAECHE, in collaboration with MACKINNON, found that, in guinea pigs previously inoculated with a streptococcus, the BCG vaccine constantly gave rise to tuberculous lesions which tended to generalise after the third passage. He himself using the same strain of streptococcus was able to confirm Hormaeche's results. While recognising the great importance of the discovery of CALMETTE and GUERIN, he insisted that the vaccine must be rendered innocuous before its universal employment can be recommended.

Professor Léon BERNARD in reply pointed out that it was not customary at congresses to take a vote on a scientific discovery and, furthermore, that the veterinary commission set up by the League of Nations had recognised the innocuity of the BCG vaccine.

PANEK, K., & ZAKCHAROFF, M. (1931). Pouvoir pathogène des cultures de formes filtrantes du Bacille tuberculeux. [Pathogenicity of Cultures of the Filterable Virus of the Tubercle Bacillus.] *C.R. Soc. Biol. Paris*. 106. 854-857. [1 ref.]

The authors carried out experiments to determine the pathogenicity for laboratory animals of cultures of the filterable form of the tubercle bacillus.

They employed 12 strains of the granular form obtained from rabbits and guinea pigs infected either with tuberculous material or with cultures of human or bovine origin. Acid-fast bacilli could not be observed in any of the cultures used for the injection of guinea pigs. Inoculations were made subcutaneously, intraperitoneally, intravenously and intracardially. The only symptom that persisted after inoculation was a moderate degree of oedema of the lymphatic glands near the site of injection. During the last 4 years the authors have inoculated 78 guinea pigs which have given negative reactions to previous tuberculin tests. During the 6 months following inoculation, 12 animals died or were killed and acid-fast bacilli were found in 9 of them, either in the lymphatic glands or in the spleen; nodules or necrotic foci were present in 3 out of the 9 in the lungs, liver and spleen.

From the seventh to the thirteenth month, 23 animals died or were killed; acid-fast bacilli were found in 18 and tuberculous lesions were present in 14 of them.

The authors have found that the pathogenicity of cultures of the filterable form of the tubercle bacillus is much lower than that of the normal bacillus. Guinea pigs inoculated with this form showed no symptoms for a long period but, eventually, some became emaciated and died. At autopsy there were usually more or less extensive lesions of tuberculosis in these animals and they contained acid-fast bacilli. The lesions were of a chronic sclerotic nature and were particularly pronounced in the lymphatic glands of guinea pigs which died several months after inoculation. The development of lesions depended upon many factors:— the quantity of virus inoculated, the original virulence of the strain of organism from which the virus was derived, the route of injection and the individual susceptibility of the inoculated animal.

KARWACKI, Léon. (1931). Bacille tuberculeux comme forme évolutive d'un streptothrix. [The Tubercle Bacillus as a Developmental Form of a Streptothrix]. *Zlb. Bakt. (Orig.)* 119. 369-374. [2 refs.]

During the course of diagnostic work on tuberculosis, the author has often found a streptothrix along with acid-fast bacilli. Similarly, he found that when he resumed work with certain old, dried-up cultures of *B. tuberculosis* after the war, a streptothrix was frequently present in the subcultures, sometimes in a state of purity and sometimes mixed with acid-fast bacilli. He assumes that the streptothrix is a fungoid form developed from the bacillary form and that it loses its acid-fast character during the process, an observation which supports the view that *B. tuberculosis* belongs to the fungi. He found that, when the vitality of a virulent culture of the tubercle bacillus is weakened by mixing it with distilled water or saline solution, leaving the suspension for some weeks and then sowing it on culture media, streptothrix organisms begin to appear after two to eight subcultures at intervals of a few weeks. Altogether, the author produced 200 strains of the streptothrix culture. The way in which tubercle bacilli are transformed into a filamentous form is obscure; the author considers that it is certainly not a direct change and he advances some possible theories. The pathogenicity of these streptothrix forms for guinea pigs varies considerably. Agglutination and other serological tests with either streptothrix antigen and streptothrix or tuberculous infection, or tuberculin and streptothrix infection, usually gave negative results, but as a rule the antibodies of the sera of rabbits, immunised against tuberculosis, fixed complement with streptothrix suspensions.

— (1930). Report of the Special Committee on Abortion. *J. Amer. Vet. Med. Ass.* 77. 491-493.

This is one of six or seven committees appointed annually by the American Veterinary Medical Association to consider and report on major problems of veterinary science. As each committee is comprised of men who are recognised authorities on their own respective subjects, these reports are of very considerable value.

It is the opinion of this Committee that, of the various factors responsible for abortion and other breeding troubles, Bang's disease is by far the most important. It should be recognised, however,

that the other factors may occasionally cause considerable losses in herds which have been freed from *Br. abortus* infection.

Nutritional mineral deficiency, other than that of iodine, has not been proved to give rise to abortion under average farm conditions.

In the light of present knowledge, the best method of controlling the disease is the elimination of infection by means of the agglutination test and the establishment of clean herds. The Committee recommends that a serum titre of 1:100 should be accepted as indicating infection and that a titre of 1:50 should be regarded as suspicious. This recommendation is based on the failure to isolate *Br. abortus* from animals whose serum reacts in titres lower than 1:100.

The Committee points out that the significance of suspicious reactors cannot be determined by a single test and that such animals should be tested monthly until changes in the agglutinin content of the serum permit of a definite diagnosis.

Animals giving suspicious reactions over long periods should be removed from healthy herds. Abortion-free herds should be tested at intervals of six months and infected herds at intervals of three months or even less.

In the opinion of the committee the veterinary practitioner has an important duty to perform in the control and eradication of Bang's disease. The stockowner depends on him for an interpretation of the results of laboratory tests and for advice as to the disposal of animals that give positive or suspicious reactions.

While it is recognised that, in a considerable number of herds, it is impracticable to pursue an eradication policy based on the isolation of infected animals, there are few herds in which it is impossible to improve existing conditions and to reduce infection by the use of calving stalls and attention to hygiene.

The Committee believes that both bovine and porcine strains of *Br. abortus* are important in relation to public health, but to an extent which has not as yet been definitely ascertained. There would no longer appear to be any doubt that the milk of cows infected with *Br. abortus* may sometimes cause undulant fever in man. Human infection can also occur through direct contact with infected cattle or swine.

SCHUMANN, & LERCHE. (1930). Beiträge zur Bang-Infektion des Rindes. I. Mitteilung. Infektionsversuche bei Kühen. [**Bang Infection in Cattle. Part 1. Infection Experiments with Cows.**] *Deuts. tierärztl. Wschr.* 38. 789-797.

The animals used for the experiments described in this paper were obtained from farms which were free from infection. Prior to purchase, all animals on the premises were subjected to blood tests and, after purchase but before use, each animal was again blood tested a number of times.

The authors detail experiments in which (a) cows were given infective material (stomach contents from infected calves) *per os*, (b) cultures were inoculated subcutaneously and (c) calves were tested with a view to determining whether they could become infected before they were covered.

They find that cows can be infected *per os*, but that the success of an infection experiment depends upon the stage of pregnancy. It was possible to infect cows *per os* at the 5th month of pregnancy and by subcutaneous inoculation at the 4th month. The authors confirm the current opinion that pregnant cows should not be inoculated with culture and that injection with culture a few weeks prior to service is risky. Abortion is only a symptom of infection which is not invariably present.

The interval elapsing between subcutaneous inoculation and the resulting abortion varies, but it appears to depend to some extent upon the stage of pregnancy at which abortion occurs.

MITCHELL, Chas. A., & DUTHIE, R. C. (1930). **The Udder as a Reservoir of *Br. melitensis* (abortus) Infection of Cattle.** *Canad. J. Res.* 2. 403-405. 2 tables. [4 refs.]

The authors discuss the possibility that infection of the udder plays a part in the general problem of infection with *Br. abortus*, that the udder is a seat of focal infection harbouring organisms when the animal is not pregnant and that such a focal infection leads to the distribution of the bacilli in the placental tissues during pregnancy. An attempt was made to approach the problem by deter-

mining the effect of removing the udder from two cows which gave positive reactions to the agglutination test.

Case 1 is described as a "two-year-old cow at the 228th day of her first pregnancy." Agglutination tests prior to December 1928 were negative. From then onwards the agglutination titre rose until in April 1929 it was 1 in 600. The udder was removed surgically at that time and abortion occurred a fortnight later. After the operation, the agglutination titre fell steadily until by the end of December it was 1 in 25. It remained at this level up to the time of writing. Guinea pigs inoculated from the udder tissue became infected, but others inoculated from the supra-mammary glands remained healthy.

Case 2 was a four-year-old cow which had aborted 10 months previously and had not bred subsequently. The agglutination titre was 1 in 25,000 for nearly a year. *Br. abortus* was proved by animal inoculation and by cultivation to be present in all four quarters of the udder.

The udder and supra-mammary glands were removed on June 6th 1929 and animal inoculation showed that both were infected. The agglutination titre fell rapidly and by the end of August it was only 1 in 100. It was still at this level in March 1930.

MIRRI, Adelmo. (1930). Contributo alla conoscenza delle lesioni anatomiche ed istologiche nell'infezione naturale da bacillo di Bang. [**The Anatomical and Histological Lesions in Natural Infections with Bang's Bacillus**]. *Clin. Vet. Milano*. 53. 1-10. 7 plates. [11 refs.]

In this paper the author describes his findings in two cases of infection with Bang's bacillus in boars and in two cases in bulls.

The first case in a boar was detected in an animal recently imported from England. Agglutination tests showed a reaction up to 1 in 400 and the animal was therefore slaughtered. Lesions ranging in size up to a lentil were found scattered through the cortex of the left kidney and in the prostate. All the other organs, including the testicles, appeared to be normal. Cultural examination revealed the presence of an organism which the author identified as Bang's bacillus. It was remarkable that guinea pigs and rabbits inoculated subcutaneously and intraperitoneally all died in 24 hours to 6 days. Further examination of the strain, however, confirmed the author in his opinion that the organism was in fact Bang's bacillus.

Microscopical examination revealed a certain degree of vascular congestion associated with round-celled infiltration. In places this was to a large extent distinctly interstitial in distribution, but destruction of the tubes was proceeding in the larger lesions. The glomeruli appeared to offer resistance to destruction. The abscess-like lesions were surrounded by connective tissue and the central area was composed of plasma cells and lymphocytes. Polynuclear leucocytes were present only in small numbers.

The lesions present in the prostate resembled those in the kidneys.

The second case in a boar occurred on premises where the sows had been aborting, and there was clinical evidence of testicular disease. Agglutination tests showed positive reactions up to 1 in 150 and 1 in 300 in the sows and 1 in 800 in the boar. The author advised that the boar be castrated and the testicles were obtained for examination. The left testicle appeared to be normal but there was extensive disease of the other. This took the form of nodules of considerable size in a condition of caseation and calcification. No opportunity was obtained of examining the other organs. Special steps were taken to detect the presence of tubercle bacilli and Bang's bacillus, but cultural examination and biological tests all yielded negative results.

Microscopical examination showed the presence, around the caseous centres, of cell masses resembling the giant cells of tuberculous lesions. It was difficult to determine whether these represented remnants of tubular epithelium or whether they were reaction products.

The author concludes that the failure to demonstrate the presence of tubercle bacilli by biological tests and the resemblance of the lesions to those found in the prostate of the previous case, coupled with the high agglutination titre, is in favour of the view that the lesions were caused by Bang's bacillus.

The third case occurred in a bull from infected premises and the left testicle was involved. No blood was obtained for agglutination tests; the left testicle was the only organ available for examination.

Sharply defined, whitish centres were present in the testicular substance but the testicle was not markedly enlarged. Cultural examination yielded a mixture of organisms, which were probably contaminants but inoculated guinea pigs developed agglutinins and the bacillus of Bang was recovered by culture from their organs.

Microscopical examination of the diseased testicle revealed the presence of a slight cellular infiltration with cells of the connective tissue type, lymphocytes and polynuclear leucocytes associated with incipient necrosis of the cells of the tubules.

The fourth case also occurred in a bull from an infected herd. A blood test yielded agglutination at 1 in 300. The left testicle was normal but the right one was markedly reduced in size and, in section, appeared to be a mass of fibrous tissue in which abscess-like lesions of various sizes were embedded, one of which formed about one-fifth of the whole mass. Bang's bacillus was recovered by culture and by biological test.

Microscopical examination showed masses of cicatricial tissue containing abscesses composed of necrotic centres surrounded by reaction capsules.

HENRY, B. S., & TRAUM, J. A. (1930). **A Comparison of Factors Influencing the Agglutination Test for *Brucella abortus*.** *J. Infect. Dis.* **47**. 367-379. 5 tables. 1 fig. [7 refs.]

The proved accuracy of the tube agglutination test for the detection of carriers of *Br. abortus*, in conjunction with the efforts which are being made to establish abortion free herds, has made it a widely employed laboratory procedure.

There are numerous variations in the technique employed at different laboratories and it is clear that the employment of a standardised test, at least with regard to the important details, would be a progressive step.

HENRY and TRAUM have done useful service in investigating some of the more important factors influencing the results of the test.

They have found that formalized antigen (0.25 per cent. formalin) has a tendency to intensify or cause pro-agglutination with human, bovine and porcine sera and that, on this account, strongly positive sera may occasionally be missed in large scale routine testing.

This phenomenon did not occur when the antigen was preserved with phenol (0.5 per cent.) or tricresol (0.2 per cent.).

The authors investigated six methods of treating the serum-antigen dilutions. The most reliable and practicable method was found to be incubation at 37° C. overnight, the tubes being allowed to stand for a couple of hours at room temperature before the first reading is taken. The tubes are then held at room temperature until the following day when a final reading is made.

Any agglutination above 1:50 is considered by the authors to be positive. They found that a moderate degree of variation in the opacity of the antigen had little influence on the interpretation of results.

GILBERT, S. J. (1930). **An Unusual Strain of *Brucella* Causing Abortion of Cattle in Palestine.** *J. Comp. Path.* **43**. 118-124. [4 refs.]

Clinical abortion appeared to have been non-existent in Palestine during the first two years under the Mandate, but a virulent outbreak occurred in Jerusalem among animals imported from Damascus or bred on the premises from cattle of the Damascus breed. After the disease appeared, blood tests were carried out with sera from different parts of the country and 30 per cent. of positive results were obtained although no abortion had been observed.

Abortion began to occur following the importation of European cows and, in some instances, it was traced to imported animals. These animals came mainly from Holland and the majority of them had been tested prior to export. In three instances the organism recovered from affected animals appeared to be identical with a European strain employed in the routine test at the laboratory (Lister E. 624).

Negative reactions were obtained subsequently in certain cases in which abortion had occurred and a *Brucella* strain was isolated from one of these cases. Careful examination of this strain shewed that two types of colony were present in the cultures, a lenticular and a round type. Further work

is being done with emulsions made from colonies of each type. The cultural characters, pathogenicity, agglutination and absorption tests are described and contrasted. The local strain appears to be of low virulence, but it is capable of causing abortion; severe outbreaks have not, however, been traced to this type. There is evidence to suggest that sheep and goats are commonly carriers of the infection and it is possible that passage through cattle exalts the virulence of the organism for sheep and goats. The author concludes that the local strain appears to be intermediate between *Br. melitensis* and *Br. abortus*.

GWATKIN, Ronald. (1931). **The Effect of Killed Cultures and Filtrates of *Brucella abortus* in the Prevention of Infection in Guinea Pigs.** *J. Infect. Dis.* **48**. 381-403. 18 figs, 6 tables. [8 refs.]

Various preparations of killed bacilli and filtrates of *Brucella abortus*, when inoculated subcutaneously and intraperitoneally into guinea pigs, all failed to afford protection against experimental infection given by the mouth or instilled into the eye.

The author found that, while the agglutination titre resulting from the injection of these dead vaccines was lower than when live cultures were used, complement fixation was of equal intensity in both cases.

The lesions resulting from the administration *per os*, or from instillation into the eyes, of virulent material containing *Brucella abortus*, were found to be identical with those which develop after intraperitoneal inoculation.

TRAUM, J., & HENRY, B. S. (1930). **Boric Acid for the Preservation of Milk Naturally Infected with *Br. abortus*.** *J. Infect. Dis.* **47**. 380-383. 1 table. [4 refs.]

There are difficulties in the preservation of milk samples for despatch to laboratories for biological tests for the presence of *Br. abortus*. Unless the samples are refrigerated or an antiseptic is used, the growth of contaminants leads to the death of laboratory animals inoculated with the milk.

GILBERT, COLEMAN and GROESBECK have shown that 30 per cent. glycerol will not destroy *Br. abortus* in milk.

TRAUM and HART found that tubercle bacilli survive in milk preserved with one per cent. boric acid and that such milk can be sent a considerable distance, even during warm weather, without becoming contaminated to such an extent as to interfere with laboratory examination or the results of inoculation into guinea pigs.

It was ascertained in a preliminary test that milk from cows which were known to be excreting *Br. abortus* was infective to guinea pigs when preserved with one per cent. of boric acid and kept at room temperature for 40, 66 and 94 hours.

Experiments were then carried out with the mixed milk from 20 cows with high agglutination titres. The milk was divided into 7 samples and was placed in amber-coloured, rubber-stoppered bottles. Three of the samples were preserved with one per cent. of boric acid; one was placed in the ice-box, one was kept at room temperature and the third was incubated at 37° C. Three untreated samples were kept under the same temperature conditions. The seventh sample was preserved with 30 per cent. of glycerol and kept at room temperature.

Samples were taken from each bottle after varying intervals and were centrifuged at 2,500 revolutions per minute. The cream and sediment were mixed and 2 to 2.5 c.c. amounts were injected into guinea pigs.

Only one guinea pig survived the inoculation of unpreserved milk kept at room and incubator temperatures and, at autopsy, the animal was free from *Br. abortus* lesions which indicated that the organisms had been destroyed by the acidity of the milk.

Br. abortus survived for at least 253 hours in unpreserved milk kept in the ice-box.

It survived for the same period in milk preserved with one per cent. boric acid and kept at room temperature and for 118 hours when the milk was kept at 37° C.

In a further test it was shown that 7 out of 10 samples of milk, untreated except for the addition

of one per cent. of boric acid, gave positive results when injected into guinea pigs 48 hours after being drawn.

The authors conclude that one per cent. of boric acid is a safe and efficient preservative for milk intended for the diagnosis of *Br. abortus* by guinea pig inoculation.

HAUPT, H. (1931). Kurze Mitteilung über einen zur Züchtung des *Bact. abortus* Bang geeigneten Nährboden. [A Short Note on a Culture Medium suitable for the Growth of *Br. abortus*.] *Zlb. Bakt. (Orig.)* 120. 130-131.

An account of a culture medium used for a year with good results at the Institute of Veterinary Hygiene of the University of Leipzig. Ordinary 2 per cent. nutrient agar (1 per cent. meat extract, 1 per cent. peptone, 0.3 per cent. sodium chloride, and 0.2 per cent. of Sorrensen's phosphate) is put up in amounts of 100 c.c. To each 100 c.c., 1 per cent. of a 1.5 per cent. alcoholic solution of bromthymol blue (grass green colour—pH 6.8) is added and the medium is stored. Immediately before use 0.5 per cent. of glucose and 0.2 c.c. of a 1 per cent. alcoholic solution of basic fuchsin are added to each 100 c.c. The whole is heated for 10 minutes at 110° C., cooled to about 50° C. mixed with 10 c.c. of sterile serum and poured out into Petri plates.

McNUTT, S. H., & PURWIN, Paul. (1931). The Acidity produced in *Brucella* Cultures. *J. Infect. Dis.* 48. 292-294. 1 table. [7 refs.]

After testing the acid production of 43 strains of *Brucella* from various sources, grown in a variety of basic media, the authors conclude that it is not possible to make any classification by the results of carbohydrate reactions.

The organisms seemed to produce an alkaline end-product in culture which neutralised any acidity produced. Estimations of the amount of sugar, before and after inoculation with the organisms, frequently showed a decrease after incubation, although no acidity could be noted. Growth occurred fairly constantly in arabinose and xylose when the sugar was made the only source of carbon in the medium.

KRISTENSEN, Martin. (1931). Klassifikation dänischer und anderer Brucellastämme. [Classification of Danish and Other Strains of *Brucella*.] *Zlb. Bakt. (Orig.)* 120. 179-196. 10 tables. [14 refs.].

An attempt was made to classify, according to their serological and biological behaviour, various strains of *Br. abortus* and *Br. melitensis* of bovine, porcine, caprine, ovine and human origin, obtained from Denmark, Sweden, England, Germany, Italy and the U.S.A. This report is a continuation of similar studies by KRISTENSEN and HOLMS (1929). The present work is described under five headings:—(1) serological experiments; (2) cultivation experiments with methyl violet and thionin; (3) a differentiation test based on H₂S formation; (4) a CO₂ atmosphere test and (5) the formation of acid from glucose, etc.

No typical distinguishing features could be found for *Br. abortus*, *Br. melitensis* and the Danish porcine strains in agglutination and agglutinin-absorption tests. The strains could be divided into three groups according to the intensity of growth in culture media containing methyl violet or thionin:—(a) all English, Danish and Swedish bovine and human strains, one Italian, two German bovine strains and a *melitensis* strain of unknown origin, all of which showed a greater tolerance towards methyl violet than towards thionin; (b) some German and Italian strains of *Br. abortus* and *Br. melitensis* of human, bovine, ovine and caprine origin, all of which tolerated the addition of both dyes even in high concentration; and (c) American strains of a pronounced porcine type and the Danish porcine strains, all of which tolerated thionin better than methyl violet. All the Danish strains of bovine and human origin behaved as typical *Br. abortus* in relation to the methyl violet and thionin tests and to the formation of H₂S, whereas the Danish porcine strains behaved exactly like American porcine strains in the former tests, but differed from the latter in the absence of H₂S formation and in some minor details.

PANISSET, L. (1930). La Fièvre Ondulante et l'Avortement épizootique. Transmission à l'Homme. [Undulant Fever and Contagious Abortion. Transmission to the Human Subject.] *Rev. gén. Méd. vét.* **39**. 129-138.

This paper is in the nature of a general review of the subject and contains only material abstracted from previous publications. The author's conclusion is that there is no need to raise an alarm that mankind is threatened with a new plague, but the fact that there is a real danger must be recognised.

— (1931). Entschliessung des Staatsministeriums des Innern vom 27 Dezember 1929 Nr. 5303c5 über die Erforschung der Abortus-Bang-Bazilleninfektion bei Menschen. [The Decision of the [Bavarian] State Ministry of the Interior of 27th December, 1929. No. 5303c5 concerning the Investigation of *Br. abortus* Infection in Human Beings.] *Münch. tierärztl. Wschr.* **82**. 36-37.

A circular letter addressed to local authorities, medical men and veterinarians employed by the Bavarian Government in country districts. Medical and veterinary officers must report all cases of human *Br. abortus* infection in their districts to the Bacteriological Research Institute in Munich and to the Veterinary Police Institute in Schleissheim. They must also carry out any additional investigations and examinations of suspected herds or households, or despatch infective material or fetuses as and when instructed by these two institutes. A fee of RM. 10 is paid for each foetus which is sent to the laboratories and RM. 2 are paid for each sample of blood and milk taken from animals and despatched to the institutes. The routine of reporting is described in detail.

EDGINGTON, B. H., & BROERMAN, Alvin. (1931). A Comparison of the Intradermal and Agglutination Tests for Pullorum Disease, Based on Demonstrating the Infection in the Hatch from Reactors. *J. Amer. Vet. Med. Ass.* **78**. 219-224.

In a brief survey of the literature dealing with the comparisons between the agglutination test and the intradermal test, the authors point out that, in nearly every case, the agglutination test has been used as the standard of control.

The present paper records a study of the efficiency of the tests basing the comparison on the demonstration of infection in the hatches.

For the intradermal tests, 5 strains of *S. pullorum* were grown on agar for 3 days. The growth was washed off in carbolised salt solution, filtered through paper and washed twice. The heavy-cell sediment was suspended in decinormal sodium hydrate for half an hour and then diluted to 10 times its volume of carbolised salt solution. No quantities of any kind are given by the authors. The "pullorin" had a pH of 8. 0.05 c.c. were introduced into the skin of the wattle and observations were made 18 and 24 hours later. Oedema persisting up to 24 hours was considered to be an indication of a positive result. In the agglutination tests, the same 5 strains of the organism were used for the suspension at dilutions of 1:25, 1:50 and 1:100. Complete agglutination at 1:25 was considered positive. No details are given of the suspending fluid or of the density of the suspension.

A flock of 301 birds, known to be infected, was subjected to test. Twenty-four birds reacted to both tests (group 1), 20 to agglutination only (group 2) and 27 to "pullorin" only (group 3).

These 3 groups were housed separately; the eggs were used for hatching and, during the period of the experiments, 10 different hatches were obtained from each group. A table shows the eggs incubated, the chicks hatched and the mortality in the 3 groups. Eggs from group 1 yielded 39.6 per cent. of chicks with a mortality of 43.5 per cent. Eggs from group 2 yielded 45.3 per cent. of chicks with a mortality of 60.5 per cent. Eggs from group 3 yielded 45.7 per cent. of chicks with a mortality of 2.5 per cent.

A table shows the results of a bacteriological examination of the chicks which died and from this it is gathered that *S. pullorum* was present in 95.6 per cent. in group 1, in 88.1 per cent. in group 2 and that in group 3, *S. pullorum* was not recovered from any of the dead birds. The birds which passed both tests were kept in isolation and 1,730 chicks were obtained from 2,400 eggs. A few of chicks the died but *S. pullorum* was not detected.

The conclusion is that the intradermal test as used in the experiment was not so efficient as the agglutination test.

BUNYEA, Hubert. (1931). **Pullorum Disease.** *J. Amer. Vet. Med. Ass.* **78**, 430-434.

The author considers that the increased incidence of *B. pullorum* infection in the United States may be largely attributed to the modern system of mammoth hatching.

From the point of view of prevention, the respective values of slow agglutination, rapid agglutination and pullorin tests, are not of paramount importance as compared with the disposal of reactors and proper disinfection of the premises. The method of diagnosis, however, should be standardised.

VERGE, J., & THIEULIN, G. (1931). Le milieu au "vert brillant" dans la recherche des microbes du groupe typhique-paratyphique. [**Brilliant Green Medium in the Investigation of the Typhoid-Paratyphoid Group.**] *C.R. Soc. Biol. Paris*. **106**, 521-522. [2 refs.]

Describes the use of brilliant green culture media for the differentiation of bacteria of the typhoid-paratyphoid group from other organisms.

The authors have used this method for the diagnosis of *B. pullorum* infection.

KWASCHNINA, A. S. (1931). Dissoziation und Entwicklungszyklus einiger Bakterien der Paratyphusgruppe. [**Dissociation and Development Cycles of some Bacteria of the Paratyphoid Group.**] *Zlb. Bakt. (Orig.)* **120**, 227-244. 6 tables. [26 refs.]

The author studied 35 inagglutinable strains of bacteria of the paratyphoid group isolated from milk. The organisms could be divided into the following three sub-groups according to their behaviour in litmus milk (Stutzer's classification):—(1) 8 strains which produced acid, (2) 14 strains which became alkaline and (3) 13 strains which produced acid and coagulated the milk. The morphological, biochemical and serological properties of the strains are described in detail. Colonies of the R, S and O types were obtained. The connection between the incidence of paratyphoid infections and the time of the year was also investigated. Although no conclusive proof was obtained, the author expresses the opinion that dissociation of the organisms is a phenomenon expressive of the development of the life cycle of the bacteria. The transition from S forms (virulent) through O forms to the R forms (avirulent) occurs with a greater facility than the reverse process. The majority of S forms appeared in the autumn, whereas the lactose fermenting forms were mostly produced in the spring and summer. The author advances the theory that the classification of the members of the paratyphoid group should be based rather on a study of the development of their life-cycles than on their motility, morphology, etc.

MIESSNER, H., & KOEBE, K. (1931). *Bact. Enteritidis* Gärtner- und *paratyphi* B- Ausscheider und ihre Beziehungen zur Umwelt. [**Carriers of *Bact. enteritidis* and of *Bact. paratyphosum* B and their Relationship with the Outside World.**] *Deuts. tierärztl. Wschr.* **39**, 145-150.

An attempt to trace the origin of *Bact. enteritidis* infection in calves and to discover whether *Bact. paratyphosum* B is pathogenic for cattle. In some cases the former infection was traced to adult carriers which were themselves healthy but, in others, the source of infection could not be found. It is suggested that the progeny of adult carriers may possess an hereditary predisposition towards *Bact. enteritidis* infection although most of the author's experiments on direct post-natal transmission yielded negative results. Attempts at chemotherapeutical elimination of carriers were unsuccessful. The authors could not infect calves experimentally with *Bact. paratyphosum* B.

LOVELL, R. (1931). **A Member of the Salmonella Group causing Abortion in Sheep.** *J. Path. Bact.* **34**, 13-22. 12 tables. [10 refs.]

A bacillus belonging to the Salmonella group has been isolated from aborting sheep, both in England and on the Continent. It is properly termed *Bact. abortus ovis*. The author describes the morphology, cultural characters and fermentation reactions of one German and 5 English strains and gives an account of a series of experiments to show their antigenic structure.

The strains examined by the author appeared to be identical. Antigenically the bacillus is

diphasic, and absorption and fractional absorption tests show its relationship to other members of the group. The "group flagellar antigen" is related to those of *Bact. paratyphosum B* and *Bact. paratyphosum C*, containing factors G, a trace of E_1 and of E_2 , and an unknown factor; the "type flagellar antigen" shows a definite relationship to *Bact. paratyphosum C*; the "somatic antigen" is related to *Bact. aertrycke*, *Bact. paratyphosum B*, *Bact. abortus equi*, the Derby and Reading types, and in a lesser degree to *Bact. enteritidis*.

DUTHIE, R. C., & MITCHELL, C. A. (1931). *Salmonella enteritidis* Infection in Guinea Pigs and Rabbits. *J. Amer. Vet. Med. Ass.* **78**. 27-41. 4 tables. 3 plates. [1 ref.]

The authors describe a disease of guinea pigs and rabbits in which the lesions are somewhat similar to those of tuberculosis. While animals of all ages are susceptible, the heaviest mortality occurs among the breeding females and unweaned young stock.

The most constant pathological changes are found in the spleen and liver. These consist of white or yellow necrotic foci varying in size from minute points to nodules several millimetres in diameter. In rabbits the lesions are confined to the lungs. In acute cases small gram-negative bacilli can readily be isolated in pure culture from the spleen, liver, heart-blood and bone marrow and, in subacute and chronic cases, from the lesions.

The organism grows freely on the usual laboratory media with the exception of potato. It is actively motile and aerobic.

The disease cannot be reproduced in guinea pigs by the feeding of cultures. Infection can, however, be brought about by the subcutaneous or intraperitoneal inoculation of cultures [doses not stated] or of suspensions of spleen from naturally or artificially infected animals.

Serological tests proved that the organism isolated from guinea pigs and rabbits is closely related to, if not identical with, *S. enteritidis*. The authors point out that this disease produces little or no change in the lymphatic glands; this distinguishes it from the pseudo-tuberculosis of rodents.

UBERTINI, Bruno. (1931). Caratteri culturali, biochimici e sierologici del "Gruppo intermedio" (Standfuss) paragonati a quelli dei germi del gruppo Paratifo B avvelenatori da carne.—Appendice: Alcuni reperti di Paratifo B. negli uccelli. [The Cultural, Biochemical and Serological Characters of the "Intermediate Group" (Standfuss) compared with certain Organisms in the Paratyphoid B Food Poisoning Group. Appendix: Paratyphoid B Infections in Birds]. *Clin. Vet. Milano*. **54**. 80-107.

The author describes the characters of the paratyphoid B group and of the "intermediate group." The latter possess the general biological characters of the B group, but they are not agglutinated with specific B sera.

Emphasis is laid upon the importance of the bacteriological identification of the members of this group as they are saprophytic, are widely spread in nature and appear to be non-pathogenic for man.

In the account of his own research the author describes the characters of the organisms which he allocated to the "intermediate group." These were isolated from the carcasses of animals killed in emergency or dying naturally.

One tabular statement shows the fermentation reactions of a number of strains and compares them with strains of paratyphoid B from various sources; another statement compares the agglutination tests with certain specific anti-sera of the B group.

The third section of the paper deals with the food poisoning organisms, and the characters of the various groups described.

In an appendix the author describes the occurrence of organisms of the paratyphoid B. group in pigeons, canaries and turkeys.

DELAFIELD, M. E. (1931). Changes in the Blood Sugar and Blood Phosphorus in Rabbits following the Injection of Suspensions of *Bact. aertrycke*. *J. Path. Bact.* **34**. 177-194. 7 tables, 2 charts. [39 refs.].

The mechanism whereby certain organisms exercise their pathogenic function has generally

been studied by bacteriological and immunological methods, but the literature quoted in this article indicates advancing knowledge of the chemical responses to infection. The observations of the author may be interpreted in terms of physiological reactions to non-toxic principles in the bacterial cell, but are nevertheless of a kind which may have significance in disease processes.

Intravenous injections into rabbits as experimental animals, of dead suspensions (agar slope) of *Bact. ærtrycke*, chosen as test organism and of bacterial filtrates (heart broth, Seitz filtrate), were found to cause hyperglycæmia within two hours, followed by hypoglycæmia. When death of the animal supervened, *exitus* occurred in the later hypoglycæmic phase. Rise of blood sugar was found to be associated with a fall of about a quarter in the level of inorganic blood phosphorus, with either return of the latter to normal, or rise beyond the initial phosphorus value during the hypoglycæmic phase. The organic acid-soluble fraction of the blood phosphorus increased during the hyper- and decreased during the hypo-phase. A clear correlation between disturbed sugar metabolism and partition of phosphorus compounds in the blood and tissues is claimed. Treatment of the bacterial cells by alcohol, by acetone, or by autoclaving for 15 minutes, did not alter the type of chemical response although the enzymic activity of the dead organisms, as tested by the methylene blue technique adopted by QUASTEL and WOOLDRIDGE, in their studies on *Bact. coli*, was much reduced. Diphtheria toxin did not give the same type of response, no immediate change in blood sugar or blood phosphorus being noted after intravenous injection, although both inorganic and organic phosphorus rose after some hours and reached a high figure after one to two days.

Discussion of the data centres round the references quoted, the author treating his own data as the starting point for further work on chemical changes associated with bacterial toxæmia.

GAIGER, S. H., & DAVIES, G. O. (1930). "Keel Disease" in Ducklings in Britain. *J. Comp. Path.* **43**. 125-141. [6 refs.]

The symptoms of "Keel Disease" which was so named by RETTGER and SCOVILLE in America in 1920 are:—loss of appetite, discharge from the eyes and nose, constipation, inco-ordination of movement and evidence of brain disturbance. The disease occurs in birds from one to three weeks old and the mortality is high. Death may take place within 24 hours or birds may survive for some days. The American literature indicates that an organism—*Salmonella anatum* along with *S. artrycke*—is the cause of the condition in that country and that infection takes place after the ducklings have hatched.

The authors give a detailed account of their examination of affected ducklings. They conclude that the cause is a bacillus belonging to the *Salmonella* group and that it is closely related to *Salmonella anatum*, RETTGER and SCOVILLE, non-ærttrycke type. This organism appears to be of low pathogenicity and may be a harmless inhabitant of the alimentary canal of ducklings. Some factor possibly enables it to become pathogenic and when that has occurred it is readily transmitted to other birds.

GOURVITCH, B. M. (1931). Biologie du *Bacterium pyosep. viscosum equi*. [The Biology of *Bacterium pyosep. viscosum equi*.] *Ann. Inst. Pasteur.* **46**. 64-72. [16 refs.]

Bacterium pyosep. viscosum equi (*B. nephritidis equi*, *B. pyosep. equi*, *B. equirulis*, [said by the author to be a term employed in Holland], *B. viscosum equi*) is one of the most widespread causes of pyosepticæmia in foals. Divergent opinions have been expressed regarding the biological properties of this organism. The author describes the morphological, cultural, biochemical and pathological characters of 8 strains of Russian origin.

He concludes that pleomorphism and the formation of mucus in cultures are characteristic features and that the organism is of low pathogenicity. The young dog is the most susceptible experimental animal.

———. (1930). **Fowl Cholera**. Agricultural Supplement [Cyprus] 26th December. Govt. Printer.

This is a leaflet written in popular language for stock-owners. It deals with the history, etiology, symptoms, lesions and methods of control of fowl cholera.

The disease was first diagnosed in Cyprus in 1928 and has caused considerable losses. Active

measures were immediately taken by the veterinary service and marked success was achieved by the use of a hyperimmune serum obtained from the Egyptian Government.

The disease has reappeared recently and serum obtained from Egypt and Germany has been employed for the protection of birds on infected premises, but the results have not been uniformly good.

In view of the indifferent results obtained in the latter outbreak, serum is now being prepared in Cyprus from a strain of *B. avisepticus* isolated locally. This serum gives a moderate degree of protection against artificial infection and is now being extensively employed for the control of the disease.

BANG, B. (1931). Tularæmie, eine hauptsächlich auf Ansteckung durch Hasen und andere Nager zurückzuführende Infektionskrankheit. [**Tularæmia, a Contagious Disease which is spread mainly by Hares and Other Rodents.**] *Tierärztl. Rdsch.* **37**. 57-60 & 73-75. [8 refs.]

A survey of the literature supplemented by a short account of the clinical picture of the disease in human beings, guinea pigs, rabbits, mice, sheep, goats and monkeys. Outbreaks of the disease among human beings in Russia and Norway during 1928 and 1929, as reported by SUVOROW, WOLFERZ and VORONKOVA and by THJOTTA, are described in detail.

VOLKMAR, F. (1931). Tularæmia bei Schafen und Wildhasen. [**Tularæmia in Sheep and Wild Hares.**] *Berl. tierärztl. Wschr.* **47**. 131-133. [12 refs.]

The author reviews the work of certain American authors on tularæmia.

JOWETT, Walter. (1930). **Pyobacillosis in Sheep.** *J. Comp. Path.* **43**. 109-117. 2 figs. [2 refs.].

The detection in sheep slaughtered in Edinburgh, of a disease which bears some resemblance to the well known caseous lymphadenitis, led the author to carry out bacteriological investigations for the purpose of establishing or disproving the identity of the two conditions. Actually, the two diseases were proved to be different. The author gives an account of one of the organisms found in his investigations. The cases all occurred in animals six months of age or over and, prior to slaughter, a variable degree of respiratory distress was noted: well marked broncho-pneumonia and pleurisy were found on inspection of the carcasses. In recent infections the pleural fluid was clear, straw coloured and odourless, but in more advanced cases it had an objectionable odour. The pneumonia was usually limited to the apical lobes and the line of demarcation was sharp. Abscesses containing creamy or greenish pus were found in the consolidated lung tissue. The bronchial glands showed no alteration beyond enlargement and this was not invariably present. It was noted that, in cases in which the lungs contained encapsulated abscesses, there was no evident respiratory distress during life and it is probable that these cases were on the road to recovery.

From the cases in which there was simple pneumonia, *B. ovissepticus* was recovered and, from the cases in which there was abscess-formation, a gram-positive bacillus morphologically resembling *Gorynebacterium pyogenes* was isolated. The latter was, however, of lower pathogenicity for experimental animals and its proteolytic powers were less pronounced in artificial cultures.

Tables shewing the sugar fermentation reactions of the bacillus reveal its close relationship to *G. pyogenes* of bovine origin and distinguish it from the Preisz-Nocard bacillus.

Agglutination tests and agglutinin absorption tests were tried but, owing to spontaneous agglutination, the results were not clear cut. When first isolated the organism was more pathogenic for the guinea pig than for the rabbit but its virulence for the rabbit could be exalted by passage through guinea pigs. Organisms isolated from cases of the more chronic type were of distinctly lower virulence.

ARMSTRONG, Richard R. (1931). **A Swift and Simple Method for deciding Pneumococcal "Type."** *Brit. Med. J.* Feb. 7th. 214-215. [2 refs.]

A quick method for determining pneumococcal type is of great importance in the serum treatment of human lobar pneumonia. The author recommends an adaptation of the method applied by SABIN. Pathological material containing virulent pneumococci from the patient is mixed with an equal quantity of broth and inoculated intraperitoneally into a mouse. Four hours later some peritoneal fluid is aspirated and mixed on slides with the agglutinating sera of pneumococcal types I, II and III, a normal serum being used as a control. When the reaction is positive, examination under the 1/6th inch objective shows an immediate and marked increase in the size of the organisms and agglutination soon follows.

The pneumococci inoculated must be virulent; the titre of the agglutinating sera is 1:40. Macroscopic agglutination invariably confirms the microscopic test.

WELIKANOW, I. M., & TOLSTUCHINA, E. N. (1931). Zur Erforschung der Immunität gegen die Mikroben des Malignen Ödems. [Investigations into Immunity to Malignant Oedema.] *Zlb. Bakt. (Orig.)* 12: 78-83.

An attempt was made to attenuate the virulence of *Vibrio septique* by cultivating it in media containing formol and to use such cultures as a vaccine. Pure cultures containing 0.5 to 0.7 per cent. of formol were found to be suitable for use as a vaccine and to possess good antigenic properties. Guinea pigs and rabbits inoculated intraperitoneally with suitable doses of such vaccine developed an active immunity against two to five lethal doses of one to three day-old cultures. A 1:10 dilution of the serum of these animals neutralised one to ten lethal doses of pure culture *in vitro*. A fairly potent serum could be obtained from horses immunised with the formolised vaccine. In a dilution of 1:1,000 such serum neutralised one to ten lethal doses of one to three day-old cultures of the organism *in vitro*. This serum possessed therapeutic properties provided it was injected not less than sixteen hours after infection.

SMITH, Vera. (1931). **The Bacterial Flora of Isolated Intestinal Segments.** *J. Infect. Dis.* 48. 295-303. 3 tables. [5 refs.]

Segments about 15 cm. long from the small intestines of dogs were cut out, the ends were closed and, in each instance, the piece was sutured to the peritoneum of the anterior abdominal wall. The loose ends of the intestine were anastomosed and the blood and nerve supply to the isolated segments were left intact. By making sterile punctures of these segments, at intervals, the author was able to study the bacterial flora. Two duodenal, 18 jejunal and 20 ileal operations were performed but no marked differences were found in the flora of the segments from the various situations. *Cl. welchii* and *B. coli* were found to be the commonest representatives of the bacterial content of these segments; streptococci, staphylococci and other bacteria were only present in the intestinal segments from a small number of dogs. *Cl. welchii* disappeared soon after operation, a varied pH value in the segment did not appear to influence the type of organism found. The segments did not become permanently sterile, but negative results were obtained occasionally in the examinations carried out.

LIVINGSTONE, H., & ADAMS, W. E. (1931). **Bacterial Flora of the Lower Respiratory System of Normal Dogs.** *J. Infect. Dis.* 48. 282-291. 5 tables. [33 refs.]

In view of the contradictory evidence on the subject, the authors have made bacteriological examinations of the lung parenchyma and tracheobronchial tree of 38 normal dogs. Growth was obtained from the lung parenchyma in every case; one-third of the dogs showed contamination of the tracheobronchial tissues and, in 4 out of 11 normal dogs, bacteria were cultivated from the blood. The dogs were electrocuted to obviate as much as possible the occurrence of contamination during the death struggle. The authors conclude that there is insufficient evidence to show the route or routes of infection.

BECK, M. D., TRAUM, J., & HARRINGTON, E. S., (1931). **Coccidioidal Granuloma.** *J. Amer. Vet. Med. Ass.* **78**, 490-499. 2 figs, and 2 tables. [16 refs.]

The authors here report 10 cases of coccidioidal granuloma in cattle in Southern California. Most of the human cases recorded have also been found in this state.

The causal organism is a fungus, *Coccidioides immitis*; it grows readily on common culture media and in body tissues and it occurs in pus as a highly refractile, double contoured capsule with an average diameter of 30 μ . It has only been found in bronchial and mediastinal glands and, in these situations, it gives rise to minute abscesses containing yellowish-green pus. These lesions resemble those of tuberculosis and actinomycosis and differential diagnosis can only be made by laboratory methods, the technique of which is discussed.

There is no evidence to show that coccidioidal granuloma is transmissible from one animal to another or from animals to man and *vice versa*.

The causal organism is pathogenic for the common domestic and laboratory animals but subcutaneous inoculation of culture only produces a local lesion.

COOKE (1915) and GILTNER (1918) failed to demonstrate agglutinins or complement-fixing bodies either in men or in animals affected with the disease.

The authors have investigated only the allergic reactions produced by the organism. They prepared an antigen, "coccidioidin" on the lines followed for the production of tuberculin and, after finding that it caused no reactions in normal and tuberculous guinea pigs, they used it on cattle along with tuberculin. The use of tuberculin was necessary for comparative purposes as 3 cattle which had reacted positively to tuberculin were found at autopsy to have only small lesions in the internal thoracic lymphatic glands. An organism identical to *C. immitis* was isolated from the lesions and, when inoculated subcutaneously into a guinea pig, it caused a local abscess and lesions in the omentum and lymphatic glands. Before death the inoculated animal reacted to "coccidioidin" but not to tuberculin. Further tests with "coccidioidin" were made on 59 artificially infected guinea pigs and on 3 cattle. The former all reacted to "coccidioidin" but 20 also gave positive though rather weak reactions to tuberculin. The cattle were tested 10 weeks after infection and were negative to the ophthalmic and intradermal tuberculin tests; two of them reacted positively to "coccidioidin" applied intradermally.

Tests on normal cattle with "coccidioidin" all yielded negative results: no tests were performed on tuberculous cattle. The fact that tuberculin tests have caused reactions in tubercle-free cattle infected with coccidioidal granuloma emphasises the importance of making *post-mortem* examinations on such animals.

The owners of accredited tubercle-free herds may suffer hardship from this error in the interpretation of tuberculin tests.

NEGRONI, P. (1931). Actinomycose expérimentale. [**Experimental Actinomycosis.**] *C.R. Soc. Biol. Paris.* **106**, 146.

In 1927 the author succeeded in producing severe illness with emaciation and death in numerous rabbits by intravenous or intraperitoneal inoculation with a strain of *Actinomyces maduræ* and other species of *Actinomyces*. After death all the organs were congested and there was serous transudation, but no *Actinomyces* could be recovered or even demonstrated in the tissues. Recently the author has found that rabbits are very susceptible to intratesticular inoculations with species of *actinomyces* parasitic in man, but such infections are difficult to diagnose because secondary invaders predominate.

de JONG, H. G. Bungenberg & SIAN GWAN, Ong. (1931). Ueber das Verhalten von Komplexkoazervattröpfchen in Hinblick auf in der Gleichgewichts-flüssigkeit suspendierte Bakterien. [**Concerning the Behaviour of Complex Koazervat Droplets in Relation to Bacteria Suspended in the Equilibrated Fluid.**] *Zlb. Bakt. (Orig.)* **119**, 380-384. 1 table. [3 refs.]

The terminology is new [de JONG and KRUYT. 1929. *Proc. Roy. Acad. Amsterdam.* **32**, 8], and it may therefore be explained that the word "koazervation" is used to designate a type of fluid dissociation in systems of lyophile colloids. The term "koazervat" is used for the aggregate, or colloid-rich fluid phase, separating out on "koazervation." The conditions for "koazervation" are appropriate electric discharge and adequate desolvation. A simple case would be given by

iso-electric gelatin-sol plus alcohol, or plus sodium sulphate. The term "komplexkoazervation" is used for the more complex case, in which each of two mixed sols would be stable if present alone but form a "koazervat" on mixing, e.g. gelatin-sol plus gum arabic sol, over a definite pH range.

Since it had been observed that complex "koazervat" droplets could take up charcoal and other particles, the authors considered it worth while to investigate the behaviour towards bacteria. A number of strains of *B. coli* and of staphylococci were examined in relation to three "koazervation" systems, (1) gelatin and gum arabic solutions at pH 3 and 4, (2) clupein and arabic at pH 5, and 7 to 8 and (3) clupein and gelatin at pH 9 to 10. The technique is simple but requires careful manipulation. Four similar test-tubes are taken and three of them are marked N (Nullversuch or control), K ("koazervat" layer) and G (gleichgewichtsflüssigkeit or upper layer). About 2 to 3 c.c. of a fairly dense bacterial suspension (24 hour growth on bouillon agar, using distilled water) are added to 10 c.c. of a mixture (in equal volumes) of the two selected sols, at concentration of about 2 per cent. each and at temperature 35° to 40° C. This bacteria-sol mixture is evenly divided over the fourth unmarked tube, and tube N. The latter is set aside as a control while to the former is added dilute acetic acid, 1 c.c. of one per cent. glacial, or 1 c.c. of 10 per cent. glacial. In either case "koazervation" occurs, the droplets being charged positively in the first (pH about 4) and negatively in the second. By suitable centrifuging (slow), a fairly rapid separation into two distinct layers is obtained. The lower, or "koazervat" layer, is then gelatinised by immersing the tube in water, and the upper layer poured off into tube G, rinsing in with a little distilled water. As much 0.5 N. potassium chloride solution is then added, as is required to bring to about 0.1 N. KCl; and the tube warmed to about 40° C. to clear any turbidity due to imperfect centrifuging (or secondary "koazervation" on cooling) and so leave observed opalescence due solely to bacteria. The gelatinised "koazervat" layer is also warmed with 0.5 N. potassium chloride solution to bring into solution, and washed into tube K. Water or KCl solution, as required, is then added to bring the levels and potassium chloride concentration the same in all three tubes. Comparison of the opalescence then gives the relative distribution of bacteria over G and K. The authors take "bacteria per c.c. koazervat" divided by "bacteria per c.c. upper layer" as the criterion quotient and so record three types of behaviour, entered as K, G and KG in the tabulated data. In type K the bacteria passed almost wholly into the "koazervat" layer (quotient 100 to 200). In type G the opalescence in tubes G and N was practically the same, while in K it was only 1/10th or 1/20th as great, showing very little passage into "koazervat" droplets. In the transitional type KG, the distribution over the two layers showed no striking divergence but tended to equality. Only 5 out of 71 tests, however, behaved in this way, the rest falling definitely into group K or G independently of wide variations in pH. Although these provisional experiments were undertaken for the purposes of general orientation, they are being pursued as promising usefulness in specialised methods of bacteriological research.

*DISEASES CAUSED BY PROTOZOAN PARASITES.

CORSON, J. F. (1931). *Trypanosoma rhodesiense* in the Cerebrospinal Fluid of Sheep and Goats. *Ann. Trop. Med. Parasit.* 25. 145.

Sheep and goats in an advanced stage of *T. rhodesiense* infection show serious symptoms such as inco-ordinated movements of the head, convulsions and a tendency to walk in circles or to wander aimlessly apart from the rest of the flock.

Observations on the cerebro-spinal fluid of these animals showed that, in two sheep, there were 70 and 79 trypanosomes per c.mm., as compared with 77, 6 and 1 per c.mm. in three goats. In one sheep examined the cell count of the C.S.F. was 4,800 per c.mm. whereas, in the goats, it was 257, 297 and 207 respectively.

The trypanosomes, when numerous, rapidly attached themselves by their posterior end to the larger leucocytes.

LAUNOY, L. (1931). Quelques caractères concernant la virulence d'une souche de *Trypanosoma congolense*. [Some Notes about the Virulence of a Strain of *Trypanosoma congolense*.] *C.R. Soc. Biol. Paris.* 106. 711-712.

The author investigated the pathogenicity of a strain of *Trypanosoma congolense* which he obtained

from RODHAIN, Director of the Brussels School of Tropical Medicine. The average duration of life in 31 guinea pigs after subcutaneous inoculation was just over 12 days. Mice proved to be very susceptible and died in 5 to 19 days. On the other hand, the disease ran a chronic course in a cat. After a brief loss of weight the animal soon recovered and, within three months, was heavier than at the time of inoculation; trypanosomes were always scarce in its peripheral blood.

Two rabbits also proved to be resistant and trypanosomes were only occasionally observed in blood smears. Blood from one of them was irregularly virulent for mice while the serum of both was devoid of curative value when tested on mice against the homologous strain.

The strain was particularly virulent when inoculated intra-peritoneally into a dog. Trypanosomes were very numerous in its blood 4 days after inoculation. The animal was killed *in extremis* on the 8th day after showing vomition, lachrymation, bloody stools and brownish foam from the mouth.

CARPENTIER, G. (1931). Observation d'une épizootie de trypanosomiase dans le sud de la Perse. [Observation of an Epizootic of Trypanosomiasis in Southern Persia.] *Bull. Soc. Path. exotique*. 24. 89-93.

An epizootic of trypanosomiasis affecting horses and cattle has raged for 3 years in Khouzzistan and Louristan (Southern Persia).

There have been great losses and over 3,000 horses and between 25 and 30 per cent. of the cattle owned by the civil population have been carried off by the disease. Military animals were affected in 1930 at Nauri and Dizfoul where, according to the most recent information, only 4 horses survived out of a squadron of cavalry.

The clinical manifestations were emaciation terminating in cachexia, profound anæmia, irregular fever and œdema of the limbs and, in some cases, of the genitalia. In the later stages there was incoordination of movement and marked trembling of the hind quarters.

The appetite was maintained; in some cases it was even increased. Intercurrent complications such as pneumonia supervened in a number of cases.

Trypanosomes were observed in blood smears prepared from most of the animals (13 out of 18) that were examined. Guinea pigs were inoculated with blood from 3 cases but no information is given concerning the results of the inoculations.

The author diagnosed the disease as surra on epizootiological grounds and on the morphological resemblance of the parasites to *T. evansi*.

The insect vectors of the disease were not definitely determined. Two kinds of biting flies are suspected, viz:—(a) large insects which appear to be Tabanids and (b) smaller flies which differ in size from Stomoxys. No details are given to indicate the species of these flies.

Prophylactic measures and a system of treatment have been devised for future use but they are not described in the paper. The author considers that they will be difficult to put into operation on account of the absence of any organised technical services in the country.

YUTUC, Lope M. (1931). The Incidence of Canine Surra in the Philippines. *J. Amer. Vet. Med. Ass.* 78. 246-251.

The author describes two cases of naturally contracted surra in dogs in the Philippines. The principal symptoms were:—loss of appetite, keratitis, emaciation, paroxysmal fever, general icterus, and loss of power in the hind limbs.

The first case was given three courses of treatment with tartar emetic but relapses occurred and the animal died. No *post-mortem* examination was made.

The second case was given a course of sodium antimony tartrate. After six doses had been given (daily) the blood appeared to be clear of parasites, but death took place during the third week of illness.

From a study of the parasite in moist blood preparations and in strained films and also from the results of the experimental inoculation of rats, rabbits, guinea pigs, dogs and a horse, the author concludes that the parasite was *T. evansi*.

DAVIS, L. J. (1931). **Experimental Feline Trypanosomiasis with especial Reference to the Effect of Splenectomy.** *Ann. Trop. Med. Parasit.* **25**, 79-89. [12 refs.]

Up to the present no investigations have been conducted on the effects of the removal of the spleen in trypanosome infections of the cat, though the author showed in a previous paper that splenectomy plays an important rôle in the pathogenesis of experimental feline piroplasmosis.

The cat is susceptible to artificial infections of *T. brucei* and dies after a period of 22 to 26 days from a subacute type of infection. Very little is known, however, concerning the behaviour of the cat to experimental *T. rhodesiense* infections.

As a result of his experiments in Khartoum with local strains of *T. brucei* and *T. rhodesiense* both on healthy and on spleenless cats, the author found that, although the symptoms and course of the disease set up by the two organisms were very similar, there was an important difference in the blood picture of the two conditions. In animals affected with *T. rhodesiense* there were twice the number of trypanosomes in the peripheral blood as there were in cats affected with *T. brucei*. In neither case were posterior nuclear forms found.

By the application of Taliaferro's statistical method of analysing the nature of the host resistance, the author found that a moderate degree of continued reproductive activity existed in both normal and splenectomised cats.

LAUNOY, L., PANISSET, L., & PRIEUR, Mlle. (1931). Un cas d'évolution lente du surra expérimental chez le chat. [A Case of Slow Evolution of Experimental Surra in the Cat.] *Rec. Méd. vét. exot.* **4**, 27-30. [1 ref.]

T. evansi is pathogenic for cats. It causes an acute or subacute illness which, on an average, terminates fatally after a course of 21 days or so, though there is a case on record in which death was delayed for as long as 51 days. The authors report an experimental case in a young kitten in which the disease dragged on for 197 days when the animal was destroyed on account of its emaciated condition. This particular animal was inoculated with 1 c.c. of blood from a mouse in which trypanosomes were swarming in the peripheral circulation. The kitten remained quite healthy at first though trypanosomes were observed in its blood from time to time. Two months after inoculation, however, it began to show symptoms of paresis, a slowly progressive œdema, opacity of the cornea and enlargement of the cervical lymphatic glands. Weight and condition were gradually lost and, a few weeks prior to death, the neck glands were very greatly enlarged.

Post-mortem examination revealed enlargement of the heart and spleen, and traces of albumen in the urine. Examination of the blood showed the presence of a few normoblasts while the red cell count was only 2,908,000 per c.mm. Inoculation of tissue juices and blood into mice proved that trypanosomes were still present in the various organs.

The unusual features of this case prompted the authors to place them on record.

DELPY. (1931). Renseignements pratiques pour l'identification des Trypanosomes des animaux en A.O.F. [Practical Information for the Identification of Trypanosomes in Animals in French West Africa.] *Rec. Méd. vét. exot.* **4**, 31-40.

This paper which is written for the benefit of young and inexperienced officers deals with the trypanosomes occurring in domestic animals in French West Africa. No original information is given by the author and controversial subjects are purposely avoided.

The most constant morphological features of the local pathogenic trypanosomes, *T. vivax* (cazalboui), *T. brucei*, *T. sudanense*, *T. dimorphon* (2 varieties) and *T. pecaui* (2 varieties), are presented in tabular form, special emphasis being laid on size, presence or absence of flagella, position of centrosome and shape of the posterior extremity. In order to help in the rapid identification of the trypanosomes, the author gives supplementary information concerning their precise distribution in the country and their hosts; he points out that, in the case of equine infections, œdematous lesions occur in the disease caused by *T. brucei* and allied species, whereas this is not the case in that caused by *T. sudanense*.

Finally the author endeavours to make a key for the ready recognition of the pathogenic trypanosomes of French West Africa. While this should be of some value to those for whom it was

devised, it will not bear critical examination; for example it does not cover cases in which there is a simultaneous mixed infection of polymorphic and monomorphic trypanosomes. The omission from the key of the important *namum-congolense* group (which is absent from French West Africa) negatives its use in other parts of the Continent.

NATTAN-LARRIER, L. & NOYER, B. (1931). Trypanosomiase équine du Maroc et transmission héréditaire. [*Equine Trypanosomiasis of Morocco and its Hereditary Transmission.*] *C.R. Soc. Biol. Paris.* 105. 855-858. [2 refs.]

The authors state that, in the course of work which has not yet been published, they have proved that the "El Debab" trypanosome and that of equine trypanosomiasis of Morocco, should be regarded as two varieties of the same species although both parasites have different biological characters. The "El Debab" trypanosome causes an hereditary infection in the guinea pig, whereas this is not the case with the equine parasite. They carried out a number of experiments on guinea pigs in order to ascertain whether the properties of the parasite responsible for the equine infection could be so modified experimentally as to enable it to pass through the placenta, but the results were negative. They consider that this fixed biological characteristic suggests that the "El Debab" trypanosome is passed from dromedary to dromedary and that the horse is not an habitual reservoir of infection.

NATTAN-LARRIER, L., & NOYER, B. (1931). Trypanosome du Dromadaire et Trypanosome du Cheval au Maroc. [*Trypanosomes of the Dromedary and of the Horse in Morocco.*] *Bull. Soc. Path. exotique.* 24. 112-122.

In their work, on the relationship between the dromedary and horse trypanosome, the authors experimented with strains obtained by BALLOZEL in Morocco. Both strains possess a somewhat similar pathogenic action for rabbits, guinea pigs, mice and rats, but they differ in their ability to produce hereditary infections. Whereas the equine trypanosome consistently gives negative results, the dromedary organism has a very definite affinity for placental tissues. After a series of passages from one pregnant guinea pig to another, it seems to acquire the power of causing abortion which it did not possess at the beginning of the experiment.

Neither strain could be cultivated on ordinary Novy medium or Novy media which had been modified by the substitution of guinea pig or rat blood for rabbit blood. In some tubes, in which rat blood was used, the trypanosomes survived for 5 days or so in a very much altered form. Inoculation of these forms into mice set up a mild infection which lasted for 12 days.

Serologically the two strains showed greater divergences. The dromedary trypanosome proved to be much more sensitive to the action of human serum than the equine organism. In rabbits, the dromedary strain produced a serum which firmly protected mice against the homologous strain; when tested against the equine strain, however, it delayed death for 23 days. On the other hand, serum from rabbits, inoculated against the equine trypanosome, definitely protected mice against that of the dromedary but it gave only partial protection against the equine organism.

The authors believe that the trypanosomes of dromedaries and horses in Morocco belong to the same species, but that they have developed into two distinct varieties which have acquired different biological and serological properties as the result of their specific adaptation for the horse or dromedary. They also consider it improbable that one of these animals harbours the virus which specifically infects the other. It is not likely, therefore, that sterilisation of the blood of the horses will protect the camels and *vice versa*.

SIDELKO, Seweryn. (1931). Spostrzenia nad zaraza stadnicza w powiecie Witkowskim. [*Observations on Dourine in the Witkowo District, Poland.*] *Wiadomosci Weterynaryjne.* No. 128. 101-108. [1 ref.]

An account of an outbreak of dourine between 1922-1925. Out of 130 mares that contracted the disease, 60 died during 1922-1924 and the remaining 70 animals were sold for destruction. There is a short note on the diagnosis, differential diagnosis, clinical observations and pathological anatomy. Neo-salvarsan treatment was given but it was of no value.

SCHWETZ, J. (1931). *Trypanosoma lewisi* et splénectomie. [*Trypanosoma lewisi* and Splenectomy]. *Ann. de Parasitol.* **9**. 10-14. [6 refs.]

Only two previous contributions appear to have been published regarding the effect of splenectomy upon infection with *T. lewisi*, namely those of REGENDANZ and KEKUTH (1927) and of BRUYNOGHE and VASSILIADIS (1929). The author discusses and criticises these papers at some length.

The rats of Stanleyville (*Rattus rattus frugivorus*) are infected with *T. lewisi* in the proportion of 28 per cent. and, in a small number of cases, the parasites swarm in the blood. The author notes that *T. lewisi* has never been detected in young rats and that developmental forms and even "rosettes" have been found on only one occasion in rat blood.

Splenectomy was performed upon 6 rats which were infected with *T. lewisi* but it did not appear to have any influence on the number of parasites present in the blood. In 3 of the rats, however, developmental forms were encountered after splenectomy had been performed. It is doubtful whether the operation was in any way responsible for their presence because the intervals elapsing between the operation and the appearance of the dividing forms varied from 2 to 40 days.

Splenectomy was performed upon 14 rats which, as far as could be ascertained, were healthy; 12 were kept under observation for periods ranging from 15 to 95 days but trypanosomes were not found in any of them. The following observations were, however, made on the other two rats.

Rat No. 13. A few ordinary trypanosomes were found on the seventh day. They increased in numbers up to the thirteenth day when rosettes were seen. From the fourteenth to the fiftieth day when death occurred only ordinary trypanosomes were found.

Rat No. 14. No trypanosomes were present until the thirty-fourth day after operation, when only adult forms were found. Unfortunately this rat disappeared with several others on the following day.

The author points out that the splenectomised rats harboured fleas and that they had the same opportunity to become infected after the operation as before it.

MARCHOUX, E., & CHORINE, V. (1931). Fécondation des gamètes d'*Hæmoproteus paddæ*. Conditions nécessaires et suffisantes pour qu'elle se produise. [Fertilisation of the Gametes of *Haemoproteus paddæ*. Conditions necessary and sufficient for its Production]. *C.R. Soc. Biol. Paris*. **106**. 530-531.

In two previous papers the authors recorded that the *in vitro* fertilisation of the gametes of *Hæmoproteus paddæ* was influenced neither by the concentration of the blood nor by refrigeration.

In the present communication they bring forward evidence to show that the phenomenon is influenced both by the pH of the blood and by the amount of carbon dioxide gas that it contains.

Fertilisation did not occur at a lower pH than 7·3, but it proceeded normally between pH 7·6 and pH 9·0. Similarly it was found that fertilisation was prevented when blood containing the parasites was exposed for a few seconds to an atmosphere charged with CO₂.

Details of various experiments supporting these conclusions are given.

RAMPON, L. (1931). Sur les piroplasmoses du cheval. Notes cliniques.—Essais de Traitement. [Equine Piroplasmosis. Clinical Notes and Treatment Tests.] *Rev. vét. et J. Méd. vét.* **83**. 205-217. [2 refs.]

The author considers that the mere presence of piroplasms in the blood of horses does not always indicate that they are the cause of illness and that, therefore, diagnosis must be very carefully made. He gives some case records of both piroplasmosis and nuttalliosis in horses. Whilst the former usually responds to trypanblue therapy, the latter does not; treatment with a single intravenous dose of one gramme of neutral quinine hydrobromide in 20 c.c. of distilled water, combined with 0·5 g. of stovarsol, given either intravenously or subcutaneously daily for 3 days, is recommended for curtailing the illness in the early acute stage.

SERGEANT, E., DONATIEN, A., PARROT, L., & LESTOQUARD, F. (1931). Transmission héréditaire de *Piroplasma bigeminum* chez *Rhipicephalus bursa*. Persistance du parasite chez des tiques nourries sur des chevaux. [Hereditary Transmission of *P. bigeminum* in *Rhipicephalus bursa*. Persistence of the Parasites in Ticks nourished on Horses.] *Bull. Soc. Path. exotique*. 24. 195-198.

It has already been shown that *Rhipicephalus bursa* can transmit bovine babesiasis (*B. bigemina*) in North Africa. In the present paper SERGEANT and his collaborators record further experiments with this tick. They found that *B. bigemina* can pass through the egg, so that larvæ and nymphs descended from infected females are infective, i.e. infection of ticks is hereditary.

Moreover, if immature but infected ticks feed on a non-susceptible animal during the larval-nymphal phase, they do not clean themselves of infection; in other words they are still capable of transmitting the piroplasm to susceptible cattle on which they feed as adults.

It is of interest to note that a benign form of redwater is transmitted by this tick.

COWDRY, E. V., & HAM, A. W. (1930). The Life Cycle of the Parasite of East Coast Fever in Ticks transmitting the Disease. *Science*. 72. 461-462.

In this article the authors discuss briefly the observations which they made on the development of *T. parva* in the common brown tick of Africa, *Rhipicephalus appendiculatus*. The work was carried out at the Veterinary Research Laboratory, Kabete, Kenya Colony, and was undertaken at the invitation of the Secretary of State for the Colonies and the Government of Kenya.

The observations were made on 6 principal series of ticks:—(a) infected as larvæ, (b) controls, fed on a clean animal as larvæ, (c, d and e) infected as nymphæ and (f) controls, fed on a clean animal as nymphæ. The experiments were complicated for 3 reasons. First, because only a small percentage of ticks fed on blood containing parasites retain them throughout their life. Secondly, the general presence of symbionts was a confusing factor in the testing of smears soon after engorgement. Thirdly, most ticks, both infective and clean, contained a protozoan parasite, different from that of East Coast Fever, with proliferative phases in the macrophages in the tick's body and, to a lesser extent, within the intestinal epithelial cells.

All the animals used for the feeding of ticks were carefully reared and free from other tick-borne diseases.

The authors found that the life cycle of *T. parva* in ticks is divisible into the following stages:—

(1) The parasites soon emigrate from the red blood corpuscles into the gut of the tick but they may remain in the cells for as long as 6 days after the ticks drop off engorged.

(2) In the lumen of the gut what appear to be male and female forms are distinguishable and, possibly, further research may show that it is here that conjugation takes place.

(3) Many free forms are destroyed in the gut; others are digested within the intestinal epithelial cells in association with digestive spherules; still others penetrate intestinal epithelial cells in which they grow independently of the spherules.

(4) These intra-cellular parasites appear about the sixth day. Between the sixth and twenty-third day, their diameter increases approximately five times. They are recognisable up to the thirty-first day, that is to say over the period of moulting which was accomplished, in the several infected series, on the twenty-fourth, twenty-fourth, twenty-fourth and eighteenth days after engorgement.

(5) From the day prior to moulting, through actual moulting and as late as the thirty-first day, these intra-epithelial forms change into motile, euglena-like forms. These penetrate the wall of the gut and enter the body cavity, whence they make their way to the salivary glands where they may be seen in contact with the cells. They were last seen in the four series on the thirty-third, thirty-fourth, thirty-fifth and twenty-ninth days, respectively.

(6) For several days after their formation the euglenoids enter the salivary gland cells. Their entry was not seen in the larval series, but in the 3 series of nymphæ they were observed as early as the twenty-fifth, twenty-third and twenty-second days.

(7) Within the cells of the salivary glands the euglenoids rapidly change into deeply staining, spore-like structures which increase in size to form mulberry-like masses. The peripheral swellings on the mulberries give rise to small forms of the parasite which resemble closely those first observed in sick animals. This was the condition of the parasite usually seen in the salivary glands at the time

that the next feeding began on the twenty-ninth, thirty-third, thirty-fifth, and thirty-sixth days after engorgement.

(8) During the first four days of feeding the small forms increase greatly in number at the expense of the mulberry-like masses. Many of them are discharged into the lumina of the salivary acini but some are still seen in ticks as late as the twelfth day after attachment.

The bites of ticks, belonging to the series containing these parasites in their salivary glands, produced East Coast Fever in susceptible animals whereas those of the control clean ticks which did not possess parasites failed to do so.

BRUMPT, E. (1931). Transmission d'*Anaplasma marginale* par *Rhipicephalus bursa* et par *Margaropus*. [The Transmission of *Anaplasma marginale* by *Rhipicephalus bursa* and by *Margaropus*]. *Ann. de Parasitol.* 9. 4-9.

The author summarises the experiments reported by various writers regarding the transmission of anaplasmosis by ticks and emphasises his own failure to infect French cattle by means of the larvæ of *Margaropus calcaratus* and *Rhipicephalus bursa* from Morocco, Tunis and Algeria.

The two successful experiments which he now reports with *Margaropus annulatus microplus* and with *Rhipicephalus bursa* were carried out in 1922 and 1923. Publication was delayed in the hope that it might be possible to repeat the experiments but as this has not been possible, they are published without confirmation. Larvæ of *Margaropus annulatus microplus*, derived from a number of females which had fed on three bovines suffering from experimental anaplasmosis, infected a healthy animal with "occult" anaplasmosis. The actual infection was proved by the failure of an attempt to superinfect with the same virus and by the reproduction of the disease by inoculating its blood into a calf.

Some adult *Rhipicephalus bursa* derived from larvæ and nymphs, bred on an animal infected with anaplasmosis, *P. bigeminum* and also with *T. mutans* and *T. annulata*, infected a healthy animal with the first two of these parasites but not with the last two.

These experiments were carried out in Paris during May 1923 when the average temperature was 14-16° C. This shows that temperature is not a matter of importance as has been suggested by ROSENBUSCH and GONZALES. It is certain, too, that if a temperature of 34° C. were necessary for the development of the anaplasms in the ticks, that condition could be fulfilled in all latitudes by the fact that the ticks would be kept at that temperature in protected positions on the body during the greater part of the 24 hours while the animals were lying down.

JACOTOT, H., & EVANNO, Ch. (1931). Premières observations d'anaplasmose en Indochine. [First Observations on Anaplasmosis in Indo-China.] *Bull. Soc. Path. exotique.* 24. 104-111.

Anaplasmosis has not previously been reported from Indo-China though SCHEIN, while on a mission to the Philippines in 1924, noted anaplasms in cattle coming from Gambogia where they had undergone double inoculation against rinderpest at Pnompenh before being transhipped. On the other hand, HOUEMER observed, in the blood of a goat, anaplasmod bodies which he claimed he could transmit from one animal to another by cohabitation.

In the course of the routine blood examinations, anaplasms were frequently found at Nhatrang in indigenous calves obtained for use as virus producers, before inoculations were made, and on two occasions, they were found during the thermal reactions following inoculation. The anaplasms were most numerous during the rainy season, being present in 7 or 8 per cent. of the animals examined. Apparently they did not cause any inconvenience to their hosts.

In imported European cattle, bred on the plateau of Langbrun, no trouble has been experienced though a certain number of the beasts have been found to harbour the parasites.

Twenty-seven cross-bred sheep in the neighbourhood of Phanrang were examined during the dry season when they happened to be showing symptoms of a mild form of contagious agalaxia. They were not in very good physical condition at the time and anaplasms were found in the blood of 8 of them though no distinct clinical features of the disease were present. The authors believe, however, that the anaplasms may have contributed to the anæmia from which the sheep were suffering.

Clinical cases of anaplasmosis have been reported in locally-bred cattle coming from the plains of Southern Annam and in imported animals at Delat (1,500 metres above sea level). Forty-two cases have been diagnosed amongst the latter with a mortality of 15 (36 per cent.). In two calves and one cow there was a simultaneous infection with piroplasms of the genus *Gonderia*.

The authors are of the opinion that anaplasmosis is most apparent, particularly in local cattle, when the animals suffer a set back as a result of changed conditions, or during a period of prolonged underfeeding such as happens in time of drought. They consider that the disease may be in part responsible for the mysterious outbreaks of illness which occur during the dry season.

Excellent results are said to follow treatment with a mixture containing quinine and antipyrine. In more serious cases, where the temperature rises above 41° C., the quinine is prescribed with an arsenical, generally sodium stovarsol. Since the adoption of this method of dealing with cases, details of which are given in the paper, 18 animals have been treated without loss, whereas, previously, 15 animals died out of 24 that were sick.

ZDRODOWSKI, P., & VOSKRESSENSKI, B. (1931). Sur la sérologie comparée du groupe de Leishmanies d'origine humaine et canine. [**The Comparative Serology of the Leishmaniasis of Human and Canine Origin.**] *Bull. Soc. Path. exotique*. **24**. 37-41. [1 table.]

In a previous publication the authors described complement fixation tests with parasites and sera from human and canine sources. They now briefly recapitulate their results and the conclusions to be drawn from them. They had not been able to find any case of canine infection with human kala-azar because none of the dogs gave specific reactions with *L. donovani*. They offered no answer to the question whether, in view of the serological variations within the group *L. canis*, there was any canine strain identical with *L. donovani*. Recently, however, they have obtained material which, they assert, enables them to supply an answer to this question.

Three children and two dogs affected with leishmaniasis from Transcaucasia were available for examination. The sera of the children were positive to *L. donovani* and to what the authors call a polyvalent strain of canine leishmania but they were negative to *L. tropica*.

The serum of one of the dogs was positive to *L. donovani*, *L. tropica*, and *L. canis* (polyvalent strain). The serum of the other was positive to *L. donovani* and *L. canis*, but negative to *L. tropica*.

The cultures isolated from this dog are, the authors claim, absolutely identical serologically with cultures of *L. donovani* of human origin.

They discuss the question whether their polyvalent strain of canine origin is really polyvalent or whether it is an impure strain. They consider that it is actually polyvalent because they have maintained it for a year and its antigenic properties have remained constant.

Further tests on a large scale are required to settle the question of whether or not the canine parasites and the human parasites are identical. It must be held for the moment that serological tests indicate close relationships between some of the canine strains and the human types, but there appear to be canine strains with intermediate serological characters.

NEWSOM, I. E., & CROSS, F. (1931). **Coccidial Dysentery in Colorado Feeder Lambs in 1930.** *Vet. Med.* **26**. 140-142. 1 table, 4 figs. [7 refs.]

This note is supplementary to an article [*J. Amer. Vet. Med. Ass.* **77**. 232.] in which the disease was described. The percentage of affected lambs was 24 in each year and in 1930 the mortality averaged 2.8 per cent. with a maximum of 12 per cent. in one flock out of 6 observed. The causal organism was thought to be *Eimeria faurei* and oocysts were demonstrated in abundance in the faeces by the sugar flotation method. The authors dealt successfully with the condition by changing the pastures, withholding grain and alfalfa hay from the ration, isolating badly affected lambs and administering to them a daily dose of bismuth subnitrate (gr. 3) and tannic acid (gr. 2) in one ounce of a mineral oil.

VERGE, J. (1931). Les Coccidioses aviaires. [Avian Coccidiosis.] *Rec. Méd. vét.* 107. 65-77.

In this paper the author reviews the various types of avian coccidiosis. The predilection seat of the parasite is the intestinal tract but it may extend to the liver, kidneys and, in exceptional cases, to the lungs. The disease is considered under three headings:—intestinal coccidiosis of poultry caused by *Eimeria tenella*; coccidiosis of the pigeon due to *Eimeria pfeifferi*; and renal coccidiosis of the goose due to *Eimeria truncata*. The parasitology, pathogenesis, epidemiology, symptomatology, diagnosis, treatment and prophylaxis of each type of infection are described and the opinions of many other workers are quoted.

de LAVERGNE, V., ROBERT-LEVY, & KAISER. (1931). Durée d'évolution de la spirochétose ictéro-hémorragique chez le cobaye. [The Duration of *S. icterohæmorrhagiae* Infection in the Guinea Pig. *C.R. Soc. Biol. Paris.* 105. 939-940.]

The authors attempted to determine the degree to which the duration of the experimental disease in the guinea pig is influenced by the path of infection, by the number and by the virulence of the organisms. When infective material was introduced intraperitoneally, by scarification, subcutaneously or *per os*, the guinea pigs died, on an average, in 8, 8½, 9, and 12 days respectively. In the case of infection *per os* and by subcutaneous and cutaneous inoculation, the duration of the disease was in inverse ratio to the number of organisms administered. Exaltation of virulence by passages, as described by PETTIT and STEFANOPOULO, perceptibly shortened the course of the disease but the authors thought that the effect produced depended just as much upon the number of organisms administered and the path of infection as upon the increased virulence.

DISEASES CAUSED BY FILTERABLE VIRUSES.

JACOTOT, H. (1931). Sur la teneur en virus de quelques tissus des veaux atteints de peste bovine expérimentale. [The Virus Content of Certain Tissues of Calves affected with Experimental Cattle Plague.] *Bull. Soc. Path. exotique.* 24. 21-26. [1 table.]

It is well known that, in cattle plague, the virus is actually present in all the tissues, organs, secretions, etc., but, apart from the blood, we have little or no knowledge of the relative richness of these tissues in virus.

The author has attempted to gather some information in this connection by taking pieces of tissue from various parts of the body of infected calves, grinding them with sterile sand in normal saline and testing the effect of inoculating dilutions of the suspensions into calves or goats.

No attempt has been made at absolute precision, but certain conclusions can apparently be drawn from the results obtained.

Although the entire animal organism may contain the virus, the average content of the various tissues is not very high. The mucous membrane of the fourth stomach appeared to be the most virulent tissue examined and it was virulent in a dilution of 1:300,000. The mucous membranes of the trachea, mouth, vulva, vagina, the skin, the blood, the spleen, the liver, the lungs, lymphatic glands and thymus tissue, were not usually virulent in dilutions above 1:25 to 1:50,000. These results are in accordance with the fact that the most severe lesions occur in the mucous membrane of the fourth stomach.

JACOTOT, H. (1931). Un procédé pour conserver et pour transporter le virus pestique (bovine). [A Method of Preserving and Transporting Rinderpest Virus]. *C.R. Soc. Biol. Paris.* 106. 706.

It is well known, especially in tropical countries, that rinderpest virus rapidly loses its virulence outside the body of the host. Great difficulty has, in consequence, been experienced in many countries in transporting virus suitable for inoculation purposes to any considerable distance from a laboratory. The author made the very important observation that the virus can survive for several months in certain organs at zero temperature. He found that one gram of finely prepared spleen pulp was still virulent for a susceptible calf after being kept at this temperature for 7 months in one instance.

and after 5 months in another. On the other hand, infected blood was quite avirulent after being stored for a month at 0° C.

Details of the preparation of the spleen pulps and of experiments carried out to test their potency are given in the paper.

MOLINIE, J. P. (1931). La Peste Bovine. Contamination à l'espèce porcine. [**Rinderpest. Infection in the Porcine Species.**] *Rec. Méd. vét. exot.* **4.** 5-26.

There is still some difference of opinion regarding the susceptibility of the pig to rinderpest. In the present paper, however, the author produces evidence to show that swine do play a not unimportant rôle in the epizootiology of the disease. Not only are these animals susceptible but their reaction is of such a nature that they may possibly make valuable virus producers. After artificial inoculation of virus, symptoms of rinderpest appear regularly in 4-5 days, rarely during the third day. The disease is characterised by great prostration, anorexia, rapid and difficult respirations, progressive emaciation, epistaxis, vomiting, etc. Diarrhœa is irregular and, in some animals, constipation may actually be present. In most cases, however, dysentery appears during the crisis of the disease. It is a very serious symptom and, as a rule, indicates an unfavourable termination. The disease runs a course varying between 5 and 14 days or so, but usually it lasts 7-9 days. Very good curative results are said to follow massive inoculations with anti-rinderpest serum.

The pathology of the disease varies in different individuals and depends upon the severity of the infection and the mode of introduction of the virus. At *post-mortem* examination, the most constant lesions are erosions of the mucosa of the gums, hyperæmia and ulceration of the gastric mucous membrane, acute hæmorrhagic enteritis, enlargement of the mesenteric lymph glands, nephritis and broncho-pneumonia.

In many cases, rinderpest in swine resembles hog cholera, but the two diseases are immunologically distinct. It is interesting to note, however, that BURGEON found numerous *B. suispestifer* in the mesenteric glands of pigs which had died of rinderpest.

Under natural conditions, swine may contract the disease after the ingestion of meat from a rinderpest carcass but this mode of infection appears to be uncommon. Most cases follow actual contact with sick cattle or buffalo. Experimentally, the blood of infected cattle or pigs readily infects healthy swine. Susceptible cattle can be infected by contact with sick pigs or by inoculation with the blood or even the urine of such animals. Recovery, as in bovines, generally confers a lasting immunity which probably persists throughout life. Indeed, cattle, zebu and swine vary little in their susceptibility to the virus. The disease can be as readily transmitted from one species to another as it can be passed from one individual to another of the same species.

It is very doubtful whether the pig acts as a reservoir of the virus, but the author believes that passage through the body of this animal increases the virulence of an attenuated virus.

He gives copious notes on his observations of rinderpest in swine under field conditions. There seems to be no doubt that, in Cochin China at any rate, the disease may cause serious loss in swine.

BEATON, W. G. (1930). **Rinderpest in Goats in Nigeria.** *J. Comp. Path.* **43.** 301-307. [3 charts.]

During an investigation of contagious pleuro-pneumonia of goats, some of the experimental animals were attacked by a disease simulating rinderpest. This occurrence prompted the author to carry out the experiments recorded in this paper.

The clinical picture of the disease is as follows:—there is an incubation period of 4 or 5 days, the coat stares and there is a rise of temperature. On the seventh or eighth day the fæces become soft, there is a mucoid nasal discharge, frequent protrusion of the tongue and some waxy lachrymation. By the tenth to the fourteenth day, a fine eruption appears on the lips and gums which, in the course of a day or two, becomes converted into a thick furry deposit. The incessant movement of the tongue scrapes away the deposit leaving a raw surface. A cough develops accompanied by dyspnoea and diarrhœa becomes profuse. Death occurs in the third week. The disease is not, however, invariably fatal and the absence of serious respiratory distress is a favourable sign; recovery is rapid. It is not certain whether the pneumonia is specific or whether it is a complication. It has been found that the temperature of goats varies very considerably, but anything over 103° F. is taken as pathological.

The important lesions found in fatal cases are :—inflammation throughout the alimentary tract with ulceration in the mouth, larynx and fourth stomach, congestion and diphtheresis of the mucous membrane of the gall bladder and pneumonia and pleurisy with commencing adhesions.

Details of experiments are given to show, (1) the infectivity of rinderpest blood from bovines for goats, (2) the infectivity of goat blood for bovines and other goats, (3) the infection of healthy goats by contact with infected goats, (4) the infectivity of the contact strain of the virus for goats and bovines, (5) the infectivity of the first passage goat strain in bovines for goats and bovines, (6) the infectivity of reacting bovines for susceptible goats in contact with them and, finally, (7) the infectivity of reacting goats for susceptible bovines.

The author states that goats have been subjected to serum-simultaneous inoculation with virulent bovine blood and bovine anti-serum, as well as to vaccination with bovine spleen vaccine but no details of these experiments are given. Time has been spent also in differentiating the rinderpest pneumonia of goats from the contagious pleuro-pneumonia of that species.

GILDEMEISTER, E. (1931). Ueber das Vorkommen des Virus der Maul- und Klauenseuche in Pockenlymphe. [On the Occurrence of Foot and Mouth Disease Virus in Smallpox Lymph.] *Zlb. Bakt. (Orig.)* **120**. 83-85.

As the occurrence of the virus of foot and mouth disease in smallpox lymph has been reported in Norway, the author examined several samples of lymph obtained from German laboratories. Inoculations into guinea pigs failed to demonstrate the presence of the virus in the lymph.

D'AUNOY, Rigney, & BEVEN, J. L. (1931). The so-called Splenic Lesions in Canine Rabies. *J. Infect. Dis.* **48**. 335-336. [1 ref.]

LENCI and ESQUIREL have described pathogenic changes in the spleens of rabid dogs. In the course of an examination of 100 rabid, and 50 non-rabid dogs, the authors failed to confirm the specificity of these changes as similar lesions were found both in non-rabid and rabid animals.

CURASSON, G., & DESCHAMPS, A. (1931). Au sujet de l'unicité de la rage en Afrique Occidentale Française. [On the Subject of Unicity of Rabies in French West Africa.] *Bull. Soc. Path. exotique*. **24**. 154-155. [2 refs.]

As a result of intracerebral inoculations of virulent rabid material into baboons (*Cynocephalus*), the authors believe in the unicity of the virus in the French Sudan. Experimenting with a virus that they obtained from DABBADIE they made eleven successive passages through baboons between the 19th December and 20th March without being able to detect any modification of its virulence when tested on a rabbit and two guinea pigs. The authors consider that a young baboon of 3 to 5 kg. body weight is an excellent experimental animal, even better than the rabbit which, in the Sudan, is not always easy to obtain. A possible disadvantage is that, after the second or third passage, the phase of excitation is either short or is absent altogether, but the development of the disease is most regular.

REMLINGER, P., & BAILLY, J. (1931). Présence du virus rabique dans la rate. [Presence of Rabies Virus in the Spleen.] *G.R. Soc. Biol. Paris*. **106**. 1204-1205. [2 refs.]

The authors inoculated into young guinea pigs suspensions prepared from the whole spleens of adult guinea pigs infected with street rabies virus; in each instance they introduced the suspensions subdurally and injected the balance of the whole amount into the muscles in the region of the poll. The results were positive in 8 out of 42 experiments.

In tests with spleens of infected animals, positive results were obtained in (a) 3 out of 16 rabbits, and (b) 7 out of 15 cats; 2 experiments out of 7 yielded positive results with dogs; all trials with rats were negative.

Virus was recovered from various internal organs of these animals and the authors suggest that it is not contained in the specialised tissue of the organs but in the nerves which supply them.

KERBLER, F. (1931). Ueber die Gewinnung von Virus fixe aus Schafen. [The Production of "Fixed Virus" from Sheep. *Zlb. Bakt. (Orig.)* 119. 427-430. [4 figs.]]

There has been a considerable increase in the demand for fixed rabies virus, due to the extended use of preventive anti-rabic vaccination in dogs and other domestic animals; as a result, the utilisation of rabbits as virus producers has become uneconomical. The author describes the technique he adopted in the preparation of the virus from sheep. More than 2,000 dogs have been successfully immunised with the vaccine in Hungary.

REMLINGER, P., & BAILLY, J. (1931). Sur l'existence de régions avirulentes dans le système nerveux central de chiens morts de rage. [On the Existence of Avirulent Regions in the Central Nervous System of Dogs which have died from Rabies]. *C.R. Sol. Biol. Paris.* 106. 1201-1203. 1 table. [2 refs.]

In order to gather information on this question, the authors took pieces from various parts of the central nervous system of 4 naturally infected and 6 artificially infected dogs and tested them by intracerebral inoculation into rabbits. Positive results were obtained with 57 out of 63 inoculations made. Nervous tissue was taken from the lumbar spinal cord, the cortico-bulbar tracts, the pyramidal medullary tracts, the cerebellar medulla, the white matter from the floor of the lateral ventricle, the hippocampus, the optic lobes, the anterior part of the corpora quadrigemina and the optic nerve. When virus is absent from sections of nervous tissue, the explanation may be either that the virus had not yet penetrated into it, or that the tissue may have overcome the infection. In view of these results, the authors recommend that a large block of tissue be taken from the brain and employed for the preparation of the suspension used for virulence tests, rather than the inoculation into a correspondingly large number of rabbits of small pieces of tissue taken from the central nervous system.

McKENDRICK, A. (1931). Rabies. A Review of Recent Articles. XIV. *Trop. Dis. Bull.* 28. 243-257. 4 tables. [54 refs.]

This review is subdivided into seven headings, under the sixth of which rabies in animals is discussed. With two exceptions the literature quoted in the review appeared in 1930 and, altogether, 52 papers having a bearing on the subject are referred to.

Under the heading "rabies in animals" the author draws the attention of veterinarians to the important paper by STOLNIKOFF which deals with the practical results of antirabic treatment as applied to the larger farm animals when bitten by rabid dogs. Among other papers reviewed in this section are two by REMLINGER and BAILLY, and one by REMLINGER. The latter deals with the value of the immunisation of dogs as a practicable measure which REMLINGER believes to be inoffensive and efficacious.

The other divisions of the review deal with the virus, the clinical, pathology, methods of treatment, statistics, post-vaccinal paralysis and miscellaneous items. A paper of GLUSMAN, SOLOWJOWA and PREDTETSCHENSKAJA on the filterability of the virus receives detailed attention. These authors conclude that the virus is not a pure filter passer and that in certain stages it is a visible microbe.

Under the heading "methods of treatment and statistics," the occasional use by IYENGAR and BEER of sheep in place of rabbits as a source of fixed virus at the Pasteur Institutes of Bombay and Coonoor is noted. An interesting paper from the veterinary point of view is one by LEWTHWAITE in which he describes the control of rabies, in Malaya, by the inoculation of dogs according to the Japanese method, using fixed virus, first from sheep and later, for reason of economy, from buffalo calves. The cord and brain of an Australian sheep yield about 60 doses of vaccine whereas those of a buffalo calf from one to two years of age yield about 300 doses. In both animals the course of rabies is the same, the period of incubation for fixed virus being 6 days.

Under the heading "miscellaneous," two papers are discussed which are of particular interest to the comparative pathologist. One of the papers is by HERRMANN who found that a certain number of animals which have received a course of treatment possess a solid immunity and that this lasts for

about a year. The reviewer subjects this paper to a certain amount of criticism which seems to be justifiable.

In the second paper BAILLY and MICHEL describe the beneficial action of the antirabic treatment in two dogs, one of which was suffering from ascending paralysis complicating distemper and the other from general paralysis of meningo-myelitic origin. The symptoms in the former animal showed rapid regression beginning from the 7th day after inoculation, while the second case which developed the disease as a result of treatment by the ether vaccine, rapidly recovered after a second course of treatment.

STAUB, A. (1931). Essais de vaccination systématique des porcelets contre la peste porcine. [Attempts to Vaccinate Young Pigs systematically against Swine Fever.] *Ann. Inst. Pasteur.* 46. 228-232.

The preparation of anti-swine fever serum was begun at the Pasteur Institute in Paris in 1926 but two years later its manufacture—for economic reasons—was transferred to the Algerian Institute. While the author was engaged in this work the absolute necessity of using a virus of high and of, so to speak, fixed potency was established as might have been expected. A strain of virus recovered from an Algerian outbreak was found to possess these qualities. The strain caused a rise of temperature on the fourth day, followed by death in 8 to 10 days. As a result of numerous cross-immunity tests, the author came to the conclusion that there is no plurality of virus but only variation in the degree of virulence.

The objections raised to the application of serum therapy by the author are as follows. If serum alone is used the immunity is only of short duration. Mixing the diseased with the inoculated pigs tends to improve the treatment but at best it is unsatisfactory. Simultaneous inoculation with virus and serum can be carried out but, when this is done on infected premises, losses are likely to be severe. These losses can be reduced by injecting serum first and giving virus ten days later. This, however, entails the use of large doses of expensive serum. The raising of pigs on infected premises, or on premises where the infection is kept alive by surviving carriers, becomes practically impossible.

During 1930 an experiment was carried out in a piggery near Paris in which there had been enormous losses for many years; serum was injected into pigs the day after birth and another dose of serum and a dose of virus were given ten days later. No losses resulted in 665 pigs treated in this manner.

That a durable immunity was established is indicated by the fact that no case of infection occurred although the virus was being used every week for injections; a further control was furnished by the injection of 1 c.c. of Algerian virus into one of the first batch of pigs immunised each month. None of them became ill. The only objection to the method is that it leads to the establishment of a permanent centre of infection. Its advantages are that it is safe and effective. The immunisation of the young pigs requires only two 5 c.c. doses of serum. The dose of virus is 0.1 c.c.

POOL, W. A. (1931). The Etiology of "Louping-ill." *Vet. J.* 87. 177-200 and 222-239. [46 refs.]

An historical review of publications on "louping-ill" prior to 1930.

SEN, S. K. (1931). Three-day Sickness of Cattle. [A Résumé of the Literature.] *Ind. J. Vet. Sci. & Anim. Husb.* 7. 14-23. [34 refs.]

Other common names for this disease are "stiff sickness" and "ephemeral fever." It occurs in Africa and India and, perhaps, also in Japan and in the Dutch East Indies. It affects all kinds of cattle except sucking calves; it appears very suddenly and may affect half the cattle population of an area. In Egypt most cases occur in dry, hot, weather, but elsewhere it is reported as being commoner after the rains. Affected animals become very stiff and helpless. The temperature is very high during the first day [107° F.] but falls to 104° F. on the second day. Swelling round the

eyes occurs constantly; rumination is suspended only on the first day of illness. The cause is unknown and some workers claim that they have reproduced the disease in cattle by the intravenous inoculation of blood from a clinical case. The mortality is only about 2 or 3 per cent. and spontaneous recovery is usual. Various workers have reported quick recoveries after the use of certain drugs but these treatments probably had no effect on the course of illness.

NICOLAU, S., & GALLOWAY, I. A. (1930). L'encephalo-myélite enzootique expérimentale (maladie de Borna). [Deuxième mémoire]. [**Experimental Enzootic Encephalo-myelitis: Borna Disease. (Second Memoir).**] *Ann. Inst. Pasteur*. **44**. 673-696. 12 tables, 1 fig. [13 refs.]

In this paper the authors have brought together the substance of a number of short articles which have already appeared in the *C. R. Soc. Biol. Paris*. The points dealt with are:—the preservation of the virus in the dry state and in various liquids, the properties of the virus and the action of different substances on the virus *in vitro* and *in vivo*.

According to certain German investigators, the virus of Borna disease is readily destroyed by drying. NICOLAU and GALLOWAY publish tests which lead them to the opposite conclusion. They find that desiccation and preservation *in vacuo* with P_2O_5 do not destroy the virus within 300 days or even longer. It has been shown that some of the neurotropic viruses can retain their virulence in milk and the authors have found that, at room temperature, the Borna virus remains viable in milk for at least 3 months. In parallel experiments with tap water the virus persisted for at least a month. In a single experiment in which normal salt solution was used, negative results were obtained after a fortnight.

In one series of experiments the virus was stored in normal salt solution over a range adjusted to values from pH 8 to pH 4.8. Test inoculations were carried out at various intervals up to 24 hours and from these it was obvious that a definitely alkaline medium (pH 8) was destructive to the virus, while acidity down to about pH 5 did not affect it within that period.

To determine the diffusion of the virus into liquid media, fragments of virulent brain were placed in Ringer's solution, Hartley's broth, Laidlaw's broth, glucose broth, rabbit broth plus horse serum and phosphated normal saline. It could not be shown that there was any diffusion of the virus into the first 4 of these media at 48 hours, but there was diffusion into the rabbit broth at 24 hours and into the phosphated saline up to 3 days. Rabbit broth containing virus was no longer virulent after 3 days and phosphated saline became avirulent after one week. This was not a question of cultivation of the virus but of simple diffusion. Dilution tests showed that the quantity of virus diffused was very small and the tests also showed that it survived for short periods only.

Titration was carried out to ascertain the maximum dilution that contained a fatal dose of virus. For this purpose the primary dilution was made by grinding 0.5 grammes of virulent brain in 10 c.c. of saline. This was centrifuged at high speed (5,000) for 5 minutes and dilutions up to 1:2,000,000 were made. No fatalities occurred among rabbits inoculated with dilutions higher than 1:20,000. Adsorption tests were carried out with animal charcoal and koalin and, contrary to what is the case with a number of the other ultra viruses, the results indicated that the virus of Borna disease is not readily adsorbed by these substances. A salt solution extract was found to be quite incapable of neutralising the virus and 1:10,000 potassium permanganate was found to be devoid of destructive effect upon the virus even after 3 hours' exposure. A dilution of 1:100,000 was not destructive after 24 hours.

A small series of experiments was carried out to test the value of an intravenous injection of stovarsol into infected rabbits: even repeated injections failed to prevent the development of a fatal attack of the disease.

NICOLAU, S., & GALLOWAY, I. A. (1930). L'encephalo-myélite enzootique expérimentale (maladie de Borna). (Troisième mémoire). [**Experimental Enzootic Encephalo-myelitis. Borna Disease. (Third Memoir).**] *Ann. Inst. Pasteur*. **45**. 457-523. 10 tables, 9 figs. [47 refs.]

In a previous publication, the authors were concerned with the characters of the virus of Borna disease and with the action of certain factors upon its virulence.

In the present paper, they deal with (1) the action of the virus upon experimental animals,

(2) the histology of the lesions produced and, particularly, of those found in cases of "autosterilised neuroinfections," (3) the study of the microglia in fatal cases and (4) immunity.

(1). The authors are able to confirm the view which they expressed in 1927 that monkeys (*Macacus rhesus*) are susceptible to the virus. In experiments in which the virus was injected intracranially, symptoms were first observed within 6 to 10 weeks and death took place in the 10th to the 11th week. According to ZWICK, SEIFRIED and WITTE, the fowl is susceptible to Borna disease, but NICOLAU and GALLOWAY have not been able to produce any evidence to confirm this. They performed 3 sets of experiments, using 12 birds and in every instance the result was negative. The period of incubation in guinea pigs has been found to vary considerably, but as a rule it does not exceed 2 months. The authors give an instance in which it was 363 days, death occurring 25 days later. Typical lesions were found.

Six cats inoculated subdurally all remained healthy. They were subjected to minute examination when killed at the 118th to 225th day, but no lesions were found.

Similarly, dogs resist infection but the authors found that, while no symptoms of illness follow the subdural injection of the virus, it can persist in the brain in a viable condition for long periods (up to 158 days).

They find that rabbits can be infected by intramuscular inoculation and that, occasionally, (once in 8 experiments), infection may take place when the virus is introduced into the stomach; in this case care was taken to avoid the deposition of any virus in the mouth.

Infection by simple contact appears to be exceptional but, in the authors' experiments, young animals appeared to be capable of becoming infected in this manner. The latent infection can be demonstrated by producing cerebral injury through the subdural injection of sterile salt solution.

Twenty rabbits which were inoculated in the inguinal or popliteal lymphatic glands all escaped infection.

(2). The authors deal with the discovery of JOEST-DEGEN corpuscles—nuclear inclusions which are characteristic of Borna disease—in nerve tissue which is absolutely avirulent.

They give details of a considerable number of experiments with rabbits and also of a few with horses, sheep and monkeys, which have a bearing upon this point.

The authors find that certain rabbits survive infection with attenuated virus and that such animals are resistant to subsequent subdural inoculation with fully virulent virus. Histological examination of the nervous tissues of these rabbits shows that there has been a reaction on the part of the nerve tissue to the action of the virus but that this reaction has come to a standstill. The presence of this evidence of reaction is the so-called "immunity lesion." The authors hold that this is evidence of auto-sterilisation of neuro-infection.

JOEST-DEGEN corpuscles which are frequently in process of resorption can be found and they stain in a modified manner.

When such animals die the reaction sequelæ are more obvious than when they survive.

In all these cases it is impossible to establish the presence of virus. The authors, however, draw attention to the possibility that, while virus cannot be demonstrated by intracranial inoculation, it is nevertheless possible that it is actually there—possibly in a very reduced amount—and is held in check by the tissue immunity. They refer to the experiments by PERDRAU regarding the dissociation of herpes virus plus antibody complex and to those of OLITSKY regarding the demonstration of vaccine virus and poliomyelitis virus by cataphoresis.

(3). The lesions of the mesoglia comprise hypertrophy, hyperplasia, mobilisation and metamorphosis. The changes found in Borna disease are not specific since they resemble those found by a number of research workers in other diseases due to ultraviolet viruses. The technique used for their examination was that described by DEL RIO HORTEGA in his work connected with distemper and rabies.

(4). The authors divide this part of their paper into four sections, three dealing with the production of immunity and the fourth with the detection of antibodies in animals which have been experimentally infected.

Experiments were carried out with (a) fully virulent virus, (b) virus attenuated by chance and (c) virus attenuated experimentally. It was found that carbolic glycerin acting at 26° C. attenuated the virus so as to produce an effective vaccine. The vaccine was prepared by making a 1.5 per cent. emulsion of virulent brain tissue in normal saline; one volume of this emulsion was then added to

4 volumes of a mixture having the following composition:—glycerin 60 c.c., distilled water 39.5 c.c., carbolic acid 0.5 grammes. It is ready for use after standing for 7 to 9 days at 26° C. The intramuscular or subcutaneous injection of 1 c.c. of this vaccine confers a solid immunity. About 10 weeks are required for the establishment of a degree of immunity sufficient to enable a rabbit to withstand an inoculation of virulent material into the brain.

The complement fixation test can be employed to demonstrate the presence of sensitiser in the serum of rabbits immunised against Borna disease. Antibody can also be demonstrated in the following organs and tissues in descending quantities:—in the brain, suprarenal body, testicle, ovary, liver, spleen and in the bone marrow.

It has been found that this sensitiser is not absolutely specific as it gives positive, although less pronounced, reactions with the antigens of herpes, rabies, vaccinia, etc., the converse also holds good. Cross immunity tests show that the virus of encephalo-mylitis of bovines, equines and ovines, is a single entity. There is, however, no cross immunity between Borna disease and poliomyelitis.

PACHECO, Genesio. (1931). Nouvelles recherches sur la psittacose des perroquets. [New Investigations on Psittacosis of Parrots.] *C.R. Soc. Biol. Paris.* 106. 372-374.

The author refers to a previous paper published in collaboration with BIER in which they state that they have established the occurrence of two diseases in parrots—one caused by a virus and the other by a *Salmonella*. As they were unable to obtain any strains of the virus isolated in Europe and America, they could not compare their virus with others.

The author recovered *Salmonella psittacosis* from two parrots purchased for experiment.

He isolated a virus which was not destroyed by 50 per cent. alcohol in 15 minutes; it became inactive, however, in that time in 42 per cent. commercial alcohol. Twelve minutes exposure to milk of lime (10 per cent. solution of calcium oxide) or common soap (10 per cent.) killed it. It was destroyed by ten minutes' exposure at a temperature of 55° C. and its virulence was rapidly attenuated by desiccation, even in cold storage, protected from light and air. In Bedson's glycerolised phosphate solution it retained its full vitality up to 90 days. Liver was infective in a dose of 0.0000001 gr. Intra-peritoneal inoculation was a far more certain method of producing infection than administration *per os*. The liver and spleen contained the largest amount of virus.

The disease was not transmitted from parrot to parrot when they were placed in separate cages side by side. It is probable that, under natural conditions, the disease spreads through the medium of food or water soiled with infected dejecta.

The *Salmonella* organism which the authors isolated is, they say, distinguishable from *Salmonella psittacosis* on cultural and serological grounds. They propose the name of *Salmonella nocardii* for this bacillus.

ROSENOW, Edward C. (1931). The Relation of Streptococci to the Filterable Virus of Epizootic Encephalitis of the Fox. *J. Infect. Dis.* 48. 304-334. 7 tables. 12 figs. [8 refs.]

The author suggests the possibility of filterable viruses being anærobic, non-antigenic, highly infective forms of visible micro-organisms. Dealing with epizootic encephalitis of the fox, he carried out a number of experiments which showed a very close relationship between the virus and a neurotropic streptococcus which was consistently isolated from the brains of young foxes and dogs infected with the disease. Not only was he able to set up a disease of similar symptomatology and pathology to the virus disease by inoculating these streptococci alone (after many subcultures), but he also produced a similar disease by inoculating a filtrate prepared from the streptococci. A cross immunity was found to exist between animals immunised with virus and those immunised with streptococci.

The author considers that, from his results, he is justified in assuming that the specific streptococcus gives rise to the filterable virus.

PURCHASE, Harvey S. (1930). **Active Immunisation of Fowls against Fowl Plague.** *J. Comp. Path.* **43.** 151-157. [4 refs.]

In view of the claim put forward by TODD in the *British Journal of Experimental Pathology* (9, 101.), the author repeated Todd's experiments, following exactly the technique for the preparation of the phenol-glycerin vaccine. The bulk of the paper is made up of tabular statements of the experiments performed with various batches of vaccine. There was considerable variation in the age of the vaccine employed, in the dosage and in the methods of administration, etc.

Of 46 birds used, 19 survived the three inoculations given and only 9 were found to be immune when tested with virus 7 days after the last dose of vaccine.

The period required for the vaccine to lose virulence was generally more than 7 days in the dark at a temperature of about 21° C. TODD failed to prepare vaccine from blood and attributed the failure to interference with the action of phenol on the virus by hæmoglobin or some other constituent of the blood.

Purchase's experiments with virulent muscular tissue, with and without healthy liver or normal bile, indicate that the action of the phenol appears to be dependent upon the presence of bile rather than upon the absence of hæmoglobin.

When virulent muscle was used for the preparation of a vaccine, it was found that the addition of bile accelerated its devitalisation.

Birds were given three injections of vaccine prepared from muscle, with and without the addition of liver or bile, and were then tested with virus. There was no evidence that any immunity was established.

PURCHASE, Harvey S. (1931). **An atypical Fowl Plague Virus from Egypt.** *J. Comp. Path.* **44.** 71-82. [21 refs.]

In 1929 LAGRANGE reported in Egypt what he considered to be a new disease of fowls caused by a filter passing virus.

It was differentiated from Newcastle disease by the absence of any marked respiratory trouble, by the presence of sero-fibrinous exudates in the subcutaneous tissues and by the insusceptibility of the pigeon to infection.

The disease was differentiated from fowl plague which is enzootic in Egypt by the low virus content of the blood and by a longer period of incubation.

PURCHASE studied the Egyptian virus and carried out comparative tests with the viruses of Newcastle disease and fowl plague.

He confirmed the observations of LAGRANGE concerning the period of incubation which averaged about 4 to 5 days and he also confirmed the low virus content of the blood in comparison with that of fowls dead of plague.

Young pigeons and adults resisted infection with both Egyptian and fowl plague virus, whereas the virus of Newcastle disease was invariably fatal to both.

In contact experiments, the Egyptian and plague viruses acted similarly, killing only 25 per cent. of susceptible controls while the Newcastle virus proved to be invariably fatal under the same conditions.

The author finally showed, by cross-immunity tests, that the Egyptian virus was distinct from that causing Newcastle disease but that it was immunologically indistinguishable from the virus of fowl plague.

Basing his conclusion on the symptoms, lesions, cross immunity tests and contact experiments, the author is of the opinion that the disease reported by LAGRANGE is an atypical form of fowl plague.

KERNOHAN, George. (1931). **Infectious Laryngotracheitis of Fowls.** *J. Amer. Vet. Med. Ass.* **78.** 196-202. [7 refs.]

This is a systematic account of the disease. Fowls of any age are susceptible and typical lesions have been found in turkeys, ducks, pigeons and other flying birds, such as quails, blackbirds and sparrows. Fowls between the ages of 4 and 18 months are most susceptible and the average mortality

is 20 per cent. Infection appears suddenly in the flock and deaths occur within 3 or 4 days. Birds which survive usually recover within 10-14 days. The natural incubation period is 7-12 days but the disease has been produced in young chicks by artificial infection within 36 hours. No single micro-organism, isolated from natural cases, has reproduced the disease and the primary cause is thought to be a filterable virus. The only method by which healthy birds have been infected as a rule is by intra-tracheal inoculation with tracheal exudate from natural cases. BEACH, however, claims that he produced the disease in healthy birds by the subcutaneous and intravenous injection of tracheal exudate and also by intra tracheal, intraperitoneal and intravenous inoculations with sterile Seitz filtrates.

It has been found that infective material may be present in the trachea of a fowl for at least 12 or 15 days after recovery from an attack of the disease and that a survivor is immune against re-infection. No method of immunising chicks has yet been discovered.*

GRAHAM, Robert, THORP Frank, Jr., & JAMES, W. A. (1930). **A Pleomorphic Micro-organism associated with Acute Infectious Avian Laryngotracheitis.** *J. Infect. Dis.* **47**. 83-86. 1 fig.

The authors isolated and examined numerous bacteria from the lesions of natural cases of avian laryngotracheitis studied at the Illinois Agricultural Experiment Station, but all the cultures proved to be avirulent.

Filtrates of laryngeal exudate from natural cases were not infective when tested on healthy fowls by the laryngeal route.

A gram-positive pleomorphic organism is described in detail.

KERNOHAN, G. (1931). **Infectious Laryngotracheitis in Pheasants.** *J. Amer. Vet. Med. Ass.* **78**. 553-555.

The author records an outbreak of laryngotracheitis (infectious bronchitis) in pheasants and fowls. Ducks, peacocks, pigeons, doves, parakeets and canaries were on the same premises, in separate cages, but none of these species became infected. The mortality among the pheasants and fowls was unusually high. The disease in the fowls was definitely diagnosed by reproducing it in normal fowls by intratracheal injection with a suspension of tracheal exudate.

Attempts to transmit the disease from pheasants to fowls and pigeons were unsuccessful.

There would appear to be a considerable degree of species adaptation as infection cannot be readily transmitted from one species to another.

STUBBS, E. L. (1931). **Fowl Leucemia.** *J. Amer. Vet. Med. Ass.* **78**. 434-437. [4 refs.]

The author criticises the use of the term "fowl leukæmia"; the majority of cases showing gross changes in the liver, spleen and kidneys are really affected with lymphoid leucosis, a condition in which the smaller capillaries and perivascular tissues of the affected organs are infiltrated with round cells. True leukæmia may be of two types:—erythroleucosis, where the red cell precursors are affected or myeloid leucosis, in which the changes affect the precursors of the leucocytes.

True fowl leukæmia is transmissible and, in a controlled experiment with young barred rock chickens, the author infected 52 per cent. of the fowls which he inoculated with virulent blood. Both erythroleucosis and myeloid leucosis occurred but differentiation was only possible by *ante-mortem* blood examination and microscopical examination of the liver, spleen and bone marrow. The experimental disease was characterised by paleness of the comb and wattles, slight enlargement of the liver and considerable enlargement of the spleen, without any increase in the body weight.

LUETTSCHWAGER. (1931). Untersuchungen über die Leukämie der Hühner. [Investigations regarding Leukæmia in Poultry.] *Arch. wiss. prakt. Tierhkl.* **62**. 551-566. [10 refs.]

During recent years it has become apparent that cases of leukæmia in poultry are occurring with greater frequency. The number of cases encountered at the Research Institute in Hanover

has increased from 7 in 1925 to 103 in 1930, the latter figure representing 16 per cent. of the birds examined. This disease is now a danger to the poultry industry. The available evidence shows that it is associated in many instances with tuberculosis. The liver lesions of leukæmia and of tuberculosis in fowls bear a considerable resemblance to each other. It has been suggested that the leukæmic lesions in poultry are actually caused by the tubercle bacillus but there can be no doubt that this is incorrect and that leukæmia is caused by a filterable virus. A striking resemblance between the tubercle bacillus and the leukæmia virus lies in their capacity to stimulate the body to produce granuloma-like lesions. The two infective agents differ, however, in that no retrogressive changes occur in the lesions of leukæmia. These lesions are very variable and the so-called typical cases of leukæmia seem actually to occur but seldom. A striking feature of the disease is that severe lesions of the internal organs may be present without causing any clinical manifestation. On the other hand, lesions may be absent or may be insignificant in size or latent in birds which show evidence of slowly progressive cachexia.

The liver lesions in lymphatic leukæmia consist of round lymphoid cells with a very small amount of cell body. The nodular collections of these cells gradually invade the surrounding liver tissue and, in advanced cases, liver tissue can only be found in traces between the lymphoid nodules which appear to be quite devoid of blood vessels. The author contrasts these appearances with those presented by tuberculous lesions in the liver.

The investigations of the lesions he has studied have been limited to the microscopical examination of sections. He is not prepared to say whether, as a result of infection with tubercle bacilli, leukæmia-like lesions may develop.

- I. ZINSSER, Hans, & BATCHELDER, Albert P. (1930). **Studies on Mexican Typhus Fever. I.** *J. Exp. Med.* **51**. 847-858. 1 plate. [12 refs.]
- II. ZINSSER, Hans, & CASTANEDA, M. Ruiz. (1930). **Studies on Typhus Fever. II. Studies on the Etiology of Mexican Typhus Fever.** *J. Exp. Med.* **52**. 649-659 3 plates. [8 refs.]
- III. CASTANEDA, M. Ruiz., & ZINSSER, Hans. (1930). **Studies on Typhus Fever. III. Studies of Lice and Bedbugs *Cimex lectularius* with Mexican Typhus Fever Virus.** *J. Exp. Med.* **52**. 661-668. 2 charts. [4 refs.]
- IV. ZINSSER, Hans, & CASTANEDA, M. Ruiz. (1931). **Further Experiments in Typhus Fever. IV. Infection with Washed Mexican *Rickettsia* and Immunity to European Typhus.** *J. Exp. Med.* **52**. 865-871. 1 plate, 1 chart. [5 refs.]
- V. ZINSSER, Hans, & CASTANEDA, M. Ruiz. (1931). **Studies on Typhus Fever. V. Active Immunisation against Typhus Fever with Formalinized Virus.** *J. Exp. Med.* **53**. 325-331. 2 charts. [6 refs.]
- VI. ZINSSER, Hans, & CASTANEDA, M. Ruiz, & SEASTONE, C. V. (1931). **Studies on Typhus Fever. VI. Reduction of Resistance by Diet Deficiency.** *J. Exp. Med.* **53**. 333-338. 1 chart. [8 refs.]

The results of a number of experiments carried out by the authors indicate that *Rickettsia prowazeki* (the Mooser body) is the causative agent of Mexican typhus fever. The experimental disease in guinea pigs is characterised by marked testicular swelling, the presence of *Rickettsia* in the *tunica vaginalis* lesions and an early temperature reaction. After simple experimental inoculation, the *Rickettsia* could only be identified in the tunica, but after the inoculation of benzol to inhibit phagocytosis the organisms could be found in the tunica, peritoneum, spleen, liver, pia-mater and blood. A vitamin-free diet increased the number of *Rickettsia* in the exudates.

Tunica vaginalis, ground up in broth, proved to be highly infectious and washed *Rickettsia*, inoculated into guinea pigs, reproduced the experimental disease. Subsequent tests showed that the inoculated animals were immunised against European virus.

Some experiments were carried out to demonstrate the possibility that lice and bed bugs are vectors of the disease. Although negative results were obtained when the insects were fed first on diseased and then on healthy animals, the inoculation of their crushed bodies into guinea pigs five days after they had been injected *per rectum* with virulent material, set up the disease. *Rickettsia* were found in the crushed insect tissues although they were not demonstrable in the original infective material used. Positive results were also obtained by injecting into guinea pigs the tissues of bedbugs

that had been fed on rats which had been made susceptible to *Rickettsia* infection, by the intraperitoneal injection of benzol in olive oil. These test guinea pigs were found to be immune to European virus inoculation.

Tunica material containing *Rickettsia*, when treated with 0.2 per cent. formalin for 24-48 hours, was found to protect guinea pigs completely or partially against typhus fever. The authors consider that this immunity is due to dead and not to attenuated live *Rickettsia*. A vitamin-free diet increased the severity of infection following typhus virus inoculation and this may be a possible explanation of the severity of typhus epidemics occurring during famines.

Rickettsia have not yet been cultivated, but the authors are of the opinion that Mexican and European typhus fevers are probably caused by variants of the same organism.

GWATKIN, R. (1931). Search for a *Brucella* Bacteriophage. *J. Infect. Dis.* 48. 404-407. [3 refs.]

The author attempted unsuccessfully to obtain a bacteriophage from the tissues and excreta of infected and uninfected bovines. The substances examined were faeces, milk, foetus, foetal membranes and blood. The technique of the tests is described in each case.

GRATIA, André. (1931). Sur l'identité du phénomène de Twort et du phénomène de d'Hérelle. [The Identity of the Phenomena of Twort and d'Hérelle]. *Ann. Inst. Pasteur.* 46. 1-16. 9 figs. [20 refs.]

The author considers that the phenomena of TWORT and of d'HÉRELLE are two variations of the same process. Contrary to views expressed by TWORT, it has been claimed by d'HÉRELLE that the use of bacteriophage causes no glassy change in, nor any extension of this process throughout the culture which is attacked. From his work with a staphylococcal bacteriophage (admitted as such by d'HÉRELLE), the author shows that, by varying the conditions under which the phenomenon occurs, the changes described by TWORT and also those described by d'HÉRELLE can be obtained with the same materials.

RHOADS, C. P. (1931). Immunity following the Injection of Monkeys with Mixtures of Poliomyelitis Virus and Convalescent Human Serum. *J. Exp. Med.* 53. 115-121. [9 refs.]

A 5 per cent. physiological saline suspension of pooled, glycerolated poliomyelitis virus was mixed with an equal volume of human convalescent serum, agitated and left to stand for one hour at room temperature. When repeatedly inoculated into *Macacus rhesus* monkeys by the intradermal or subcutaneous routes, this mixture protected 50 per cent. of the test animals against the inoculation of potent virus.

The neutralised material never gave rise to symptoms of the disease. An interval of 28-30 days was allowed between the last inoculation and the virus injection. Protection *via* the intranasal route, as an alternative to the subcutaneous or intradermal routes, proved ineffective. The sera of immunised animals, taken before testing with virus, proved capable of neutralising the virus. A globulin fraction of anti-poliomyelitis horse serum acted in a similar manner to the human serum.

HOFFMAN, Donald C. (1931). The Effect of Testicular Extract on Filterable Viruses. *J. Exp. Med.* 53. 43-50. [12 refs.]

The author tested the effect of the Reynal's factor on the pathogenic action of the viruses of herpes, vesicular stomatitis, Borna disease and vaccinia. When tested on shaved areas of the skin of rabbits, it was found that the testicular extract raised the pathogenicity of herpes virus. When added to the virus of vesicular stomatitis, it increased the virulence to such an extent that, whereas the normal virus can only produce a lesion on the hairless pad of the guinea pig, the mixture was pathogenic to the skin of any part of the body. The action of the Borna virus was similarly exalted.

Similar experiments with herpes virus are described and also a series designed to throw light on the nature of human post-vaccinal encephalitis.

DISEASES CAUSED BY METAZOAN PARASITES.

SKRJABIN, K. J., & PODJAPOLSKAJA, W. P. (1931). *Nanophyetus schikhobalowi* n.sp. Ein neuer Trematode aus dem Darm des Menschen. [*Nanophyetus schikhobalowi* n.sp. A new Trematode from the Intestine of Man. Zlb. Bakt. (Orig.) 119. 294-297. 3 figs, 1 table. [4 refs.]

In the examination of the fæces of 100 persons from the lower reaches of the Amur River, several eggs were found which were mistaken at first for those of *Diphyllbothrium latum*; their size and colour were, however, not quite typical and diagnostic anthelminthic treatment proved them to be the eggs of a trematode which appears to be a hitherto undescribed species of the genus *Nanophyetus*, of which only one species was previously known, namely *N. salmincola* (CHAPIN 1926) from the intestines of American dogs. A description of *N. schikhobalowi* with three figures is given, together with a differential diagnosis from *N. salmincola*; the following is the differential diagnosis:— (1) eggs of *N. schikhobalowi* measure 0.064 to 0.072×0.043 to 0.048 mm. and are smaller than those of *N. salmincola* (0.075 to 0.085×0.055); (2) eggs of *N. schikhobalowi* are shorter than the oral or ventral sucker, whereas the reverse is the case in *N. salmincola*; (3) the genital opening in *N. schikhobalowi* lies immediately behind the ventral sucker, whereas in *N. salmincola* it is more posteriorly situated; (4) the testes in *N. schikhobalowi* lie under the branches of the gut, while in *N. salmincola* they are more laterally placed.

As *N. salmincola* causes a serious disease which is frequently fatal in dogs, the pathogenicity of *N. schikhobalowi* must be carefully studied. The authors do not agree with WITTENBURG that the genus *Nanophyetus* should be taken out of the *Heterophyidae*. The members of this family do not show any close specificity in their host requirements, it is probable that *N. schikhobalowi* will also live in carnivores.

PURVIS, G. B. (1931). The Species of *Platynosomum* in Felines. *Vet. Rec.* 11. 228-229. 1 fig. [2 refs.]

Three species of the genus *Platynosomum*, *P. concinnum*, *P. fastosum* and *P. planicipitis* have been described in felines. These have been differentiated on the basis of length and width, shape of body, shape of yolk glands and size of eggs. The author collected between 1,100 and 1,400 specimens from 15 Malayan cats and made a close study of many of them; he observed that the length of mature specimens varied between 2.24 and 8.038 mm. and that there is no constant ratio between the length and width of specimens. He noted that the shape of living specimens is constantly changing through muscular action, while that of dead specimens depends upon the nature of the fluid in which they die. The size and shape of the yolk glands and of the eggs were also found to be very variable. Since it was impossible to associate any of the described shapes and sizes with flukes obtained from the various individual hosts or from various parts of the body, the author concludes that all the variants should be included under one species, and that *P. fastosum* and *P. planicipitis* are synonyms of *P. concinnum* (BRAUN 1901).

PURVIS, G. B. (1931). *Setaria labiato-papillosa* (Alessandrini, 1838) or *Setaria digitata* (von Linstow, 1906). *Vet. Rec.* 11. 528-529. [3 refs.]

Upon examining material collected from the water buffalo and the ox, the author found that the different characters described for the two species *S. labiato-papillosa* and *S. digitata* are variable and, being unable to group them in any way, he concluded that they are not of specific value. He admits, however, that he was unable to find a spicule corresponding exactly to Boulenger's figure of *S. digitata*.

In carrying out *post-mortem* examinations, he has noticed inflamed areas of the peritoneum in association with these worms; this indicates that they are not always as harmless as has hitherto been thought.

SHORB, Doys Andrew. (1931). **Experimental Infestation of White Rats with *Hepaticola hepatica*. J. Parasit. 17. 151-154. [7 refs.]**

Material for these experiments was obtained at Baltimore from wild rats of which 47.9 per cent. were found to be infected with *H. hepatica*. Half of the infected livers were cut into small pieces and incubated in three lots at 22° C., 30° C. and 37.5° C. but in 42 days the most forward of the eggs had only reached the morula stage. The other half of the infected material was fed to 6 laboratory-bred rats and the eggs of *Hepaticola*, after passing through the alimentary canal, were collected from the faeces. These were incubated in the same way and, in 25 to 42 days, those kept at 30° C. had apparently developed infective embryos and were fed to 15 rats, all of which developed infection. It is thought that, in nature, the livers of infected rats are usually eaten by some animal and that the eggs of *H. hepatica* are freed from the liver tissue during the digestive process; this enables them to develop much more quickly than they could do in the decomposing body of the host.

SZIDAT, Lothar. (1931). *Gordulia aenea* L. ein neuer Hilfswirt für *Prosthogonimus pellucidus* v. Linstow, den Erreger der Trematodenkrankheit der Legehühner. [*Gordulia aenea* L. a New Intermediate Host for *Prosthogonimus pellucidus* v. Linstow, the Cause of Trematode Disease in Laying Hens.] Zlb. Bakt. (Orig.) 119. 289-293. 3 figs. [7 refs.]

After a short discussion of the epizootiology of the fluke disease of fowls, the author describes a typical breeding place for the intermediate-host dragonflies where *Gordulia aenea*, a member of the genus which was not previously known to act as an intermediate host, occurred in large numbers. One hundred of the naiads of this species were collected for examination and experiment; 74 were found to harbour cysts of *P. pellucidus* and the 7 most heavily infected ones contained between 50 and 70 cysts each. Although the infection of dragonflies was so heavy, the author was unable to discover the first intermediate host which still remains unknown. One of the infected naiads was experimentally fed to a laying hen and, as a result, egg-laying ceased in 2 days. In 10 days the bird shewed signs of illness and, when killed on the 14th day, there was severe peritonitis which would undoubtedly have caused death.

Thirty fully developed specimens of *P. pellucidus* were found in the oviduct and they had thus reached their full size and sexual development in 2 weeks. A feeding experiment carried out on ducks gave no result although the statements of poultry farmers in the district suggest that ducks and geese suffer from a similar disease.

MAROTEL. (1931). La Lutte Antidistomienne. [The Control of Fasciola]. Rev. vét. et J. Méd. vét. 83. 127-133. [1 ref.]

The author had previously reported on the value of "Vitan" for fascioliasis in sheep and in this paper he gives an account of the successful treatment of cattle. Unless they are badly affected, treated cattle improve rapidly from the third day after the dose has been given, but the remedy is not effective when the liver has been permanently damaged.

A new anthelmintic known as "Dikadol" was also tried; this drug which is actually carbon tetrachloride was used on 38 cows in doses of 5 to 10 c.c. without accident. It was found necessary to repeat the dose in a week's time in order to kill all the flukes. Bad results have frequently been reported from the use of carbon tetrachloride in cattle and the author thinks that the makers of "Dikadol" are possibly able completely to eliminate phosgene and that this may account for his success.

The complete eradication of flukes from pasture lands is considered to be possible now that two cheap and effective drugs are available and, in order to demonstrate this point, the author has arranged a field experiment on an extensive scale.

von MOCSEY, Johannes. (1931). Bedeutung und Behandlung der Spulwurmkrankheit bei Hühnern. The Importance and Treatment of Round-worm Disease in Fowls. Deuts. tierärztl. Wschr. 39. 177-183.

From observations carried out on various poultry farms the author concludes that *Ascaridia* and *Heterakis* may do a great deal of harm by reducing egg production and by causing death. He

considers that 4-5 *Ascaridia* may be fatal in chickens and 15-20 in young hens but, because of their smaller size, 20-25 *Heterakis* may be carried without causing much disturbance of health. The diagnosis of *Heterakis* is peculiarly difficult; the cæca are not emptied at every defæcation and, even in heavy infections, eggs are not always present in the fæces.

Many remedies were tried for the expulsion of both of these worms; among others, experiments were carried out with the following:—powdered copper sulphate; a solution of copper sulphate; turpentine; benzine; oil of aniseed; areocoline; oil of eucalyptus; tetrachlorethylene; oil of chenopodium; kamala; carbon tetrachloride; kebal and ascaridol. None of these gave very promising results although large doses were employed which, in many instances, killed the experimental fowls. An organic compound of iodine was finally tried and this proved to be effective; it expelled all the *Ascaridia* and usually expelled all the *Heterakis* but it has little action on cestodes. This compound is the glycerin ester of 9-10 di-iodo-12 oxy-octadecylic acid and is marketed in a diluted form under the patent name of "Aralban"; the dose is 1 per cent. of the body weight of the fowl. The administration of anthelmintics per rectum for *Heterakis* is considered to be useless as it is impracticable to inject substances into the cæca and, as these diverticula only fill themselves occasionally, an anthelmintic injected into the rectum would be unlikely to reach the worms.

SHAW, J. N. (1931). **Some Notes on Liver-fluke Investigations.** *J. Amer. Vet. Med. Ass.* **78**, 19-26.

This disease has now become very important on the Pacific Coast and, as suitable intermediate hosts probably occur in every State, there is a danger of its spread over the whole of the United States. The author gives a few notes on the examination of snails for infection with the larva of *Fasciola hepatica* and its differentiation from other species of larval trematodes. He considers that the diagnosis of fascioliasis in sheep from symptoms alone is not easy. *Post-mortem* examination may fail to reveal the parasites and the only reliable procedure is to search for the eggs in the fæces. Death may result from a light infestation in which obvious liver lesions are not shown.

Carbon tetrachloride is strongly recommended although it is recognised that sheep are occasionally sensitive to it; a preliminary trial with a few members of the flock is advised as a routine measure.

In the discussion of this paper JAY made some observations on carbon tetrachloride poisoning. Some 200,000 doses had been administered without any untoward effect to sheep grazing on native pasture in California but when sheep were hand fed, or turned on to cultivated crops, a death rate of from 3 to 10 per cent. had occurred. In his experience, previous feeding on alfalfa, or the addition of calcium carbonate to the feed did not protect against this toxic action. As a precaution against the poisoning, sheep are now placed on very poor pasture or fed on roughage for a few days before and after the treatment. He said that the method of placing sacks of copper sulphate in the head waters of streams had been used for the destruction of snails on some ranches with considerable success.

———. (1931). **Important Parasites of Sheep and Cattle found Present in Australia for the First Time.** *J. Sci. & Indust. Res. Australia.* **4**, 64.

Monodontus phlebotomus has been identified in cattle killed at the Homebush Abattoirs and has since been found in calves on several occasions; this suggests that its occurrence is widespread. *Oesophagostomum venulosum* has also been found in sheep from the east coast of Tasmania, this being the first observation of its occurrence in Australia. It is considered that the parasite may be injurious and that it will possibly provide an explanation for certain obscure cases of unthriftiness in young sheep.

BLANC, Georges, & CHRYSSOULIS, A. (1931). La fréquence du *Tænia echinocoque* (*Echinococcus granulosus*) chez les chiens d'Athènes et du Pirée. [The Frequency of *Tænia echinocoque* (*Echinococcus granulosus*) in Dogs in Athens and the Piræus.] *Bull. Soc. Path. exotique.* **24**, 49-50. [2 refs.]

There can be no doubt that hydatid disease frequently occurs in Greece and, as the number of publications on the subject increases, the incidence of the condition appears to become greater. A large number of cases probably escape inclusion in the statistics,

The author summarises briefly the records of hydatid disease in man and then gives the results of his examination of 100 dogs impounded in Athens and the Piræus. He found the parasite in 17 of the dogs but says that this figure—17 per cent.—is only approximate. He quotes the available figures for canine infestation in a number of countries.

He considers that the high percentage of infected dogs is attributable to the large number of private slaughterhouses.

PILLERS, A. W. Noel. (1931). *Ascaris lumbricoides* Linnæus, 1758, in a Calf. *Vet. Rec.* **11**. 462-463. [1 ref.]

This is a record of the occurrence of *Ascaris lumbricoides* in association with diarrhoea and loss of condition in a three months-old calf. Three large white worms had been passed in the fæces and, after treatment with lysol and turpentine, 15 others were passed which on comparison were found to be identical with *Ascaris lumbricoides*. After the expulsion of the worms the calf's condition rapidly improved.

ROSS, I. CLUNIES (1931). **The Kidney Worm of Pigs: Its Growing Importance in Australia.** *J. Sci. & Indust. Res. Australia.* **4**. 30-33.

Stephanurus dentatus is firmly established on the east coast of Australia as far south as Sydney. In Queensland and on the north coast of New South Wales the incidence is particularly high and, in some districts, 50 per cent. of the pigs are infected. The life history which has been independently worked out in Australia is given as follows:—the eggs hatch in a minimum of 16-24 hours; larvæ reach the infective stage in 5 days and are then able to survive under suitable conditions for a period of 5 months, but they soon die if exposed to desiccation or to low temperatures. The route of infection is by the mouth or by skin penetration and, in either case, the larvæ reach the liver where they remain for 5 months before making their way as almost mature worms to their final position in the vicinity of the kidneys and ureters.

The adult worms appear to do little harm but the young worms cause considerable destruction of liver tissue and there is little doubt that a high mortality results from their activities. Special reference is made to some aspects of the economic loss through the disfiguring of carcasses and destruction of the liver and kidneys.

A scheme is being devised which involves the subdivision of pig rearing ground and periodical treatment with chemical substances whereby it is hoped to bring the disease under complete control. This subject will be dealt with in a future communication.

OZAWA, Makoto. (1931). **Experimental Study on the Anæmia caused by *Schistosomiasis japonica*.** *Jap. J. Exp. Med.* **9**. 39-45. [8 refs.]

A study was made of the changes in the blood and blood forming organs in 5 rabbits which had been subjected to a heavy experimental infection with *Schistosoma japonicum*. The anæmia appears before the onset of other symptoms and the author considers that the marked changes which he describes are due largely to the action of toxins produced by the worms and by their eggs. He associates a special toxin with the eggs because of certain changes which have been observed to occur in the bone marrow soon after egg laying commences. Destruction of blood cells by adult worms during the early stage of the infestation is considered to be of minor importance and it is concluded that the disease can properly be defined as a toxic aplastic anæmia.

BEDERKE, Otto. (1931). Qualitative und quantitative Analyse der Helminthenfauna im Dickdarm des Pferdes. [**Qualitative and Quantitative Analysis of the Worm Content of the large Intestine of the Horse.**] *Berl. tierärztl. Wschr.* **47**. 149-150. [4 refs.]

The diagnosis of worm-anæmia in horses has always been an uncertain matter and, even at

autopsy, it is difficult to estimate the importance of the helminthic infestation. Professor Skrjabin's school has recently taken up the study of the problem by determining the complete helminth content of the intestine, a method which is laborious but gives definite results. Up to the present time this detailed examination has been carried out on three horses; 52,000 specimens were collected and differentiated from the first horse; 200,000 were collected from the second and the author here records the results of his examination of the third horse. This animal which had not shewn any marked symptoms of intestinal catarrh was found to contain 32,000 worms belonging to 27 different species of 5 genera. Numbers are given of individuals belonging to the two sexes and the different species.

The author considers that the method will prove to be of great value, and that, in carrying out a survey, it is better to examine one, or a few animals, in this careful way than to do a larger number less thoroughly.

YOUNG, S. (1931). **The Changes in the Hæmatopoietic Organs and the Blood Picture in Experimental Liver-Distomiasis.** *Jap. J. Exp. Med.* 9. 47-61. 5 tables, 7 charts. [15 refs.].

Adult rabbits were artificially infested with *Clonorchis sinensis* by feeding them with fresh water fish which were infested with encysted larvæ of the fluke. The rabbits were killed at various intervals after infection and a microscopical examination was made of their spleens, bone marrow, lymph glands and livers. In addition, the blood picture was examined before and after infestation. The histological and hæmatological technique employed is briefly described and the state of the histological elements of the various tissues is illustrated in great detail by tables.

The spleen showed an average increase to nearly twice its normal size about 26 days after a heavy infestation, but it became abnormally small by the end of 53 or more weeks. After an interval of 27 days the marrow from the femora of heavily infested rabbits showed definite hyperplasia, chiefly of the myeloid elements, an increase in megacaryocytes and, to a lesser extent, in eosinophiles. This hyperplasia was absent in rabbits killed 53 or more days after infestation.

All lymph glands examined were normal.

The livers of rabbits killed about 27 days after infestation showed great change. In addition to obvious cirrhosis, there was a marked histological change represented by eosinophilia which was most marked in the connective tissue spaces near the periphery of degenerated lobules: the cells concerned were all polymorphonuclear leucocytes.

Hæmatological examinations showed chiefly a leucocytosis when there was a heavy infestation: this was most marked between the second and fifth week. The red blood corpuscle count and the hæmoglobin estimation showed practically no change.

HECKENROTH, F., & ADVIER, M. (1931). Un cas de distomatose hépatique à *Fasciola hepatica*, en Corse. [A Case of Distomatosis of the Liver, due to *F. hepatica*, in Corsica.] *Bull. Soc. Path. exotique.* 24. 46-49. [2 refs.]

According to an earlier author *F. hepatica* has been encountered 105 times in man; the case here described, along with one not included in that number, brings the total up to 107. The subject was a native of Corsica, aged 58 years, who came to the authors complaining of abdominal pains and persistent diarrhæa. Trematode eggs were found in the stools and were identical with those of *F. hepatica* obtained from flukes at the abattoir. Eggs were never very numerous in the stools and examination by the direct smear method sometimes yielded negative results.

Glycerin, sodium sulphate and calomel failed to expel the parasites but stovarsol given at 4 day periods produced a rapid improvement in the patient's condition. Three examinations of the stools have been made since that treatment was carried out; the first two showed that eggs were present in very small numbers and the last one yielded a negative result. The author points out that *F. hepatica* may not have been the cause of the symptoms and that stovarsol which was apparently quite active in checking the diarrhæa had little or no action on the parasites. This is the first case of human distomatosis reported in Corsica.

CARNEVALINI, Carlo. (1931). Sulla presenza della "linguatula rhinaria" nei bovini dell'Agro romano. [The Occurrence of *Linguatula rhinaria* in Bovines in the Neighbourhood of Rome.] *Glin. Vet. Milano*. 54. 71-80. (8 refs.)

The author summarises the previous records of the occurrence of this parasite in bovines in Italy and describes the circumstances which make its spread a simple matter.

His observations were carried out at the public slaughter house at Viterbo from August 1928 to March 1929. It was found that from 60 to 70 per cent. of the animals were affected. The parasite was found in the lymphatic glands which, as the result of invasion, were enlarged, softened and succulent. In the later stages of the invasion, the glands became caseous and finally calcified and the parasites could not be detected.

Contrary to the statement published by BUGGE, the author has not been able to detect the parasite in calves. No parasites have been found in the liver, lungs, kidneys or other organs.

———. (1931). Report of the Committee on Parasitic Diseases. *J. Amer. Vet. Med. Ass.* 78. 366.

WILSON, H. A. (1931). Prevalence of Parasitic Conditions in the Central States. *J. Amer. Vet. Med. Ass.* 78. 366-367.

LYTLE, W. H. (1931). Prevalence of Parasitic Conditions in the Pacific North-west. *J. Amer. Vet. Med. Ass.* 78. 367-368.

LEWIS, W. K. (1931). Prevalence of Parasitic Conditions in the Southern States. *J. Amer. Vet. Med. Ass.* 78. 368-369.

The committee has little to add to its previous publications. It reports progress in the control of tick fever and of scabies in sheep and cattle; bots in the horse can be controlled by systematic medication with carbon bisulphide at the appropriate season. The McLane County System for the control of round worms in pigs is employed more extensively each year.

WILSON reports that sheep scabies is very prevalent in the central States and enquiry suggests that the public market is the usual source of infection. Verminous gastritis is very prevalent; it drives a number of men out of the sheep farming industry and is a handicap to cattle rearing. Round worms in pigs are the most serious hindrance to successful pig rearing in certain districts and severe losses are also sustained from worm infestation in poultry. Worm diseases are considered to be of sufficient importance in this section to warrant special investigation by the Federal Government.

LYTLE reports that fascioliasis is the principal danger to the sheep farmer in the Pacific North-west. Sheep, calves and deer suffer considerably from lungworm infestation which appears to be on the increase. Parasitic gastritis in this section is caused by *Ostertagia ostertagi* and can be treated successfully with tetrachlorethylene. *Tænia expansa* [*Moniezia expansa*] and *Tænia fimbriata* [*Thysanosoma actinioides*] are very prevalent. Nodular disease [*Oesophagostomum columbianum*] is rare.

LEWIS reports that parasites are very prevalent in the Southern States and cause considerable losses but, apart from the application of the McLane County System for the control of *Ascaris* in pigs, little is done to check them. He gives a list of 21 parasites prevalent in these States. [The only cause of gastritis mentioned is *Hæmonchus contortus*].

GAIGER, S. H. (1931). The Position of Parasitology in the Veterinary Curriculum. *Vet. Rec.* 11. 175-176.

The author points out the immense importance of parasitology to the British veterinarian. He considers that, in the past, this subject has not received adequate recognition in the veterinary curriculum and thinks that great benefit will result when it is made a separate subject for examination in an extended course of study for a veterinary qualification. Parasitology will benefit from this change as also will zoology, pathology and medicine which were previously hampered with it.

CAMERON, T. W. M. (1931). Parasitology and the Practitioner. *Vet. Rec.* 11. 141-144.

The first part of this paper deals with the increase of helminthiases which has resulted from improved husbandry. Some general principles of helminthology are discussed and special reference

is made to ascaris in pigs and to the bursate nematodes in ruminants and equines. The periodic anthelmintic treatment of animals while still allowing them to graze the infected pastures is advocated as a method of eliminating infection from both land and animals.

MORIN, L. H. (1931). **Nose Fly Control in Horses.** *Vet. Med.* **26.** 205.

[Address—Twelfth Annual Illinois Veterinary Conference, University of Urbana, Illinois, February 10-12, 1931].

This short report of an address states that the systematic treatment of horses with carbon bisulphide for the removal of bots has been successfully begun in some countries of Illinois. The work is arranged by the Farm Bureaux and is carried out by veterinary surgeons. Up to the present some 4,200 horses have been treated and, when the treatment has been begun in an area, care is taken that no animals are overlooked.

HAYES, W. P. (1931). **The Life Cycle of the Equine Nose Fly.** *Vet. Med.* **26.** 190-191. 1 plate.

[Address—Twelfth Annual Illinois Veterinary Conference, University of Urbana, Illinois, February 10-12, 1931.]

This report of an address gives some popular information on the three species of *Gastrophilus* which are common in the United States. Up to 1926, *G. haemorrhoidalis* was only known to occur in Montana, Minnesota and south to Nebraska, but it has since become very much more widely distributed.

The old idea that bots are harmless has been shown to be wrong, as observations indicate that they at least cause general unthriftiness in horses.

INVERTEBRATE VECTORS OF DISEASE.

WALLACE, J. M. (1931). **Micro-organisms in the Gut of *Glossina palpalis*.** *Ann. Trop. Med. Parasit.* **25.** 1-19. 1 table. [20 refs.]

In this important paper WALLACE describes his investigations of the nature of the micro-organisms in the gut of *Glossina palpalis*. Although, as long ago as 1907, STUHLMANN found intracellular structures which he described as bacteroids or symbionts, later workers like CARPENTER and PRATES regarded them as long bacilli or other bacteria. Several authorities have maintained for many years that trypanosomes cannot develop in the gut of the tsetse in the presence of bacteria.

WALLACE brings forward evidence to show that STUHLMANN was correct in his estimate of the true character of these bacteroids, that the tsetse gut is apparently free from bacteria and that trypanosomes are capable of completing their developmental cycle in the presence of the bacteroids.

It is possible to infect "fly" in the laboratory by feeding them on blood containing organisms such as *B. paratyphosus* B or *B. prodigiosus*. The duration of the "infection" varies with the different organisms, the longest period in Wallace's experiments being 80 days, during which time the "fly" were apparently unaffected. Nevertheless it is very difficult to infect "fly" with bacteria even when they are maintained in a very highly contaminated environment. The reason for the persistent sterility of the gut is not yet finally known. Possibly the saliva or gut contain bactericidal or bacteriolytic substances but as yet there is no positive proof of their presence.

The author concludes that, as there are usually no bacteria in the gut of wild *Glossina*, the question of their effect on trypanosomes cannot arise though, under laboratory conditions, if bacteria are introduced into the gut of the flies, the growth of trypanosomes is apparently inhibited. The point, however, is of very little practical significance.

WALLACE describes the bacteroids as gram-negative, non acid-fast organisms which stain unevenly with Giemsa or methylene blue.

They average 5 to 7.5 μ in length, but individuals may measure up to 48 μ and resemble filaments of *Actinomyces* except that they are unbranched. Attempts to cultivate them were unsuccessful,

DIOS, R. L., & NOPOFF, R. (1931). Les Ixodoidés de la République argentine. [The Ixodoidea of the Argentine.] *C. R. Soc. Biol. Paris*. 106. 393-394.

The authors have studied 13 species in the Argentine.

I. Family Ixodidae.

Amblyomma maculatum. Larvæ placed on rats developed into adults in 60 days.

Amblyomma rotundatum was found on a number of reptiles. It reproduces entirely by parthenogenesis.

Amblyomma dissimile. One specimen found on *Lachesis alternatus* in Paraguay was examined.

Amblyomma testudinis. Males from reptiles in the zoological gardens at Buenos Aires were examined.

Amblyomma pictum was found on dogs in the Salta province.

Amblyomma furcula was found on horses at Salta, on bovines at San Juan, and on pigs at Salta.

Amblyomma cajennense. Larvæ were found on human beings and horses at Salta.

Amblyomma brasiliense was found on human beings at Jujuy.

Amblyomma altiplanum was found on llamas.

Rhipicephalus sanguineus was found on horses at Jujuy and NEIVA and PUITO transmitted *Trypanosoma cruzi* with it experimentally.

II. Family Argasidae.

Ornithodoros talaje was found at Corrientes.

Ornithodoros megnini is a parasite of sheep, cows, llamas and even man at Tucuman, Salta and Catamarca.

Ornithodoros turicata parasitises human beings and pigs. According to BLANCHARD this species transmits recurrent fever in Columbia but, experimentally, it is incapable of transmitting Spanish recurrent fever, *T. duttoni* and the recurrent fever of Venezuela [BRUMPT].

NUTTALL, G. H. F. (1930). Le rôle pathogène des tiques. [The Pathogenic rôle of Ticks.] *Bruxelles Méd. Brussels*. 10. 1359-1366.

The author discusses the pathogenic rôle of ticks in certain diseases of man, giving special attention to relapsing fever, Rocky Mountain spotted fever, *tularæmia* and *verruugo peruviana*. The paper is divided into 4 parts:— (1) a short account of the biology of ticks especially of the *Argasidae*, (2) generalities on the diseases transmitted by ticks to man, (3) direct pathogenic effects caused by ticks and (4) prophylactic measures.

Human spirochætal relapsing fever is transmitted in tropical Africa by *Ornithodoros moubata* Murray, 1877, and *O. savignyi* Andouin, 1827, and in the more temperate climates by the ordinary human louse, *Pediculus humanus*. The spirochætes which cause these diseases are morphologically similar, and are commonly differentiated by the types of illness they produce, e.g. (a) the duration and severity of the fever, (b) their pathogenic effect on different kinds of animals, (c) their behaviour in different kinds of ticks, etc., (d) their serological reactions, (e) the results of cross-immunity tests, (f) the presence or absence of antibodies in the serum of recovered animals and (g) the different grades of resistance which the spirochætes show towards arsenic and other agents. The author says that there is probably an invisible stage in the development of the spirochæte in the body of the arthropod vector. He shows that rodents and, to a certain extent, human beings are probably important reservoirs of the spirochæte in Africa. It is now definitely known that ticks can remain infective for at least three generations and probably longer.

The virus of Rocky Mountain fever is known as *Rickettsia rickettsi* and is conveyed by *Dermacentor andersoni* Stiles, 1905. This tick passes its larval, nymphal and adult stages on different hosts. The immature phases are found particularly on rodents and the adults on man and large animals such as cattle, horses, wild goats and deer. The virus is transmitted hereditarily and the ticks can become infected at each stage of their evolution. A point of the greatest interest is that the quantity of virus increases in the tick during its development after it has fed on non-infected blood as nymph and adult. It is also known that guinea pigs are valuable experimental animals. The virulence of the *Rickettsia* varies, e.g., engorged infective larvæ kept for several months at zero develop into nymphs which, although unable to produce the disease, are capable of immunising guinea pigs on which they feed. If, however, these nymphs are kept at 37° C. for 24 hours and are then placed on

guinea pigs, they can set up a light infection. The virus can survive in the tick for as long as 17 months. The highest percentage of infective *D. andersoni* was found on wild goats in the Rocky Mountains at altitudes where the goat is practically the only host of the adult ticks. The common wild rabbit tick—*Hæmaphysalis leporis-palustris*—which does not attack man, transmits the virus to rodents and is in part responsible for the spread of the disease in these animals. The Dermacentor which is found in great numbers where there are many rabbits shows a very high percentage of infection. Ticks must remain on man for 6-8 hours in order to transmit the disease; this is of great importance from the prophylactic point of view.

Tularæmia, a plague-like disease due to *B. tularensis*, occurs in a dozen species of rodents as well as in cattle and sheep. It is transmitted by blood-sucking arthropods:—(a) insects such as *Stomoxys*, *Chrysops* and fleas, and (b) ticks such as *D. andersoni* and *D. occidentalis* which convey the disease to sheep and large animals, and *Hæmaphysalis leporis-palustris* which transmits the virus to rodents. Tick excreta is infective and the virus is capable of living 8 months or longer in the tick. The disease has been diagnosed recently in Japan, Russia and Siberia.

Verruga peruviana is only briefly noticed. The positive results obtained by NOGUCHI from feeding infected *D. andersoni* on healthy *Macacus rhesus* are mentioned.

The author emphasises two points very strongly:—(a) that the viruses persist in the ticks and that in certain cases they are hereditarily transmitted and (b) that the rôle of animals, particularly rodents, as reservoirs of viruses pathogenic for man, is an exceedingly important one.

The third part of the paper is mainly occupied by a discussion on tick paralysis, a disease which occurs in man and domestic animals in Australia, South Africa and North America. The disease is invariably associated with the presence of one or several more or less completely engorged female ticks on the affected person or animal. In Australia, DODD showed experimentally on dogs that *Ixodes holocyclus* Neumann, 1899, is responsible for the disease. Children and young animals are chiefly affected and one tick is capable of causing fatal illness. In South Africa *Ixodes pilosus* Koch, 1844, causes the disease in sheep and may be responsible for great mortality. In Canada and the United States, tick paralysis chiefly affects children, but in British Columbia sheep are the principal victims. Here *D. andersoni* is again responsible and a fatal illness may be set up by one mature female.

HADWEN, NUTTALL and CLUNIES ROSS agree that tick paralysis is due to a toxin in the salivary glands of the ticks. This toxin gradually increases in amount in the glands and is most potent in the final stages of engorgement of the adult female tick. Symptoms appear 5 or 6 days after the tick has become attached to the host. Pathologically the toxin affects the motor centres; the hind quarters show the first clinical signs of paralysis and the whole body gradually becomes affected. If the ticks are not removed, the animal dies but rapid recovery follows "deticking" even in very grave cases.

As regards the prophylaxis of tick-borne diseases, special attention should be paid to the ticks. The measures to be adopted vary in different parts of the world and according to the different species of ticks. Encouraging results have followed the use of the Hymenopteron parasite *Ixodiphagus caucurtei* in the control of *D. andersoni*, the tick which transmits Rocky Mountain spotted fever in Montana.

DISEASES, GENERAL.

LERCHE. (1931). Tuberkulose, Pocken, Ruhr und Kokzidiose des Geflügels. [**Tuberculosis, Pox, Diarrhœa and Coccidiosis of Poultry.**]

- I. Die Tuberkulose des Geflügels. [**Avian Tuberculosis**]. *Tierärztl. Rdsch.* **37.** 147-149. [51 refs.]
- II. Die Kückenruhr. [**Bacillary White Diarrhœa**]. *Tierärztl. Rdsch.* **37.** 161-165. [96 refs.]
- III. Die Geflügelpocken. [**Fowlpox**]. *Tierärztl. Rdsch.* **37.** 212-214. [44 refs.]
- IV. Die Kokzidiose des Geflügels. [**Avian Coccidiosis**]. *Tierärztl. Rdsch.* **37.** 254-255. [14 refs.]

In a short introduction the author explains that he has made a full survey of the literature on these 4 diseases to cover 3 years, 1928-30 and for each disease he gives a summary designed to enable busy practitioners to acquire up-to-date knowledge.

I. A review of the literature on avian tuberculosis up to 1927 has been published by SCHMIDT, so this review is supplementary to it.

The disease is most widespread on rural poultry farms, 54 per cent. of which have been found to be infected in Saxony. Various authors have published conflicting reports on the susceptibility of the fowl to human and bovine tubercle bacilli, some claiming positive experimental results and others failing to produce infection. It is agreed, however, that avian tubercle bacilli are pathogenic for mammals, especially for the pig. Virulent bacilli may be transmitted to man from the egg and they are only killed if the egg is boiled for 5 minutes or more. Less than one per cent. of the eggs from tuberculous hens are infected so the danger to man and to chicks in fertile infected eggs is small.

The author describes a (new) case of tuberculosis of the skin of the head in a turkey hen.

Diagnosis of tuberculosis in poultry can be based on the use of the intracutaneous tuberculin test in the wattle. HAYS (1928) obtained positive results in 9.3 per cent. of 40,000 hens and GRAHAM (1929) obtained 4 per cent. of positive reactors in 700,000 hens tested.

If fowls are never kept when over 2 years old on poultry farms, the opportunities for tuberculosis to become widespread are greatly reduced. The Ministry of Agriculture for Saxony has instituted a method of control which includes systematic tuberculin testing.

Neither the Calmette nor the Friedman method of immunisation has regularly given good results.

II. WERNERY and LERCHE published reviews of the literature of white diarrhoea up to 1927 and 1928 respectively.

The author considers that the question of the differentiation of *B. pullorum* from certain other bacteria is still unsettled. HADLEY distinguished 2 forms of *B. pullorum*—A and B—the latter being identical with the fowl typhoid organism. LUETSWAGER (1929) believes that all bacteria causing typhoid diseases in poultry are related to *B. pullorum*. In any case, several transitional forms occur between the common types of *B. pullorum* and of *B. gallinarum*.

A bacteriophage without any curative properties was obtained from the intestinal contents of a chicken artificially infected with *B. pullorum*. *B. pullorum* has been found in ducklings, pheasant chicks, a sparrow, turkey chicks and goslings. Rabbits and cats are also susceptible to *B. pullorum* infection. [At the International Veterinary Conference, 1930, the German speakers upheld the view that *B. pullorum* and *B. sanguinarum* are identical. This is not the general view and, if the strict definition of the British, American and other workers for *B. pullorum* is adhered to, the occurrence of the organism in certain species such as pheasants has not been reported—a very important matter.] It is agreed that chicks are infected in the egg and that infection can spread among hatched chicks. Attempts to infect adult hens with *B. pullorum* cultures have given positive results and cases of natural infection among hens have also been reported, though 3 experiments carried out by BRUNETT (1930) on this point all gave negative results. MATHEWS (1927) traced infection in adult fowls to the ingestion of infected eggs. Eggs from a diseased ovary are not invariably infected and the organism can only enter the egg before the shell is formed. Adult hens, chiefly those which recovered from *B. pullorum* infection as chicks, are liable to become ill again at their first egg-laying period and may die. The symptoms and lesions of the infection are described.

Diagnosis of carriers of infection by the intradermal test of WARD and GALLAGHER, or by the agglutination test, is necessary for the control of the disease. Four types of agglutination test are available, the slow serum test, the rapid serum test, the rapid whole blood test and the rapid dry blood test. The various techniques are described and a comparison of them made by MEISSNER and BERGE (1930) is quoted briefly. The rapid serum test gave most positive results, the slow serum and rapid whole blood methods gave nearly similar results, but fewer positive ones than the rapid serum test. German workers favour the rapid whole blood method on grounds of combined reliability and convenience.

The best way to control *B. pullorum* infection is to remove reactors and to provide good hygiene. Incubators should be properly disinfected and young chicks should be kept on raised wire mesh floors out of reach of excreta, etc. Tincture of iodine or chinosol (1 dr. to about 1 gal.) in the drinking water is said to be beneficial.

Methods of immunisation have been tried but are not of great value for control purposes. Certain local methods of control, notably some advocated in America, are described.

III. Previous surveys of the literature of fowl pox have been made by ZWICK, SIEFRIED and

SCHAAF (1928) and by EBERBECK (1930). Fowl pox and fowl diphtheria are caused by the same virus FINDLAY (1928) apparently succeeded in cultivating the virus on embryo chick skin and brains and on blood plasma. Conflicting results have been obtained by different workers who have experimented on the pathogenicity of fowl pox virus for mammals and of vaccinia virus for fowls. Most of them were negative and it was also found that one type of virus cannot be used for immunisation purposes against infection by the other type. ZWICK, SEIFRIED and SCHAAF (1928), however, claimed to have attenuated fowl pox virus by prolonged passage through rabbits and to have produced vaccinia in a bovine by fowl pox virus passed through sheep and rabbits. EBERBECK (1930) is not satisfied with these results and suggests that mammalian and avian pox viruses should be checked for purity by testing their effects on the cornea of rabbits, fowls and pigeons, as characteristic lesions are formed in this situation.

The resistance of the fowl and pigeon pox viruses to disinfectants is described.

The transmission of fowl pox can take place in poultry shows, markets, etc. and cases have been traced to infected food sacks and to insects.

The symptoms and lesions of fowl pox, roup and A-avitaminosis are not easily differentiated; the first two can be diagnosed by transmission tests.

Fowl pox can be controlled by isolation and curative treatment of affected birds and by the protective immunisation of healthy ones.

Therapeutically, hexamethylene-tetramin and sterile milk have been used successfully.

Several methods of immunisation have been attempted, some with unchanged and some with attenuated virus, the attenuation being produced by passing the virus through pigeons. Pigeon pox virus is effective for immunising chickens by cutaneous inoculation.

IV. Avian coccidiosis is as common as bacillary white diarrhoea. It is caused by several species of coccidia—*Eimeria tenella*, *E. mitis*, *E. acervulina*, *E. maxima* and *Cryptosporidium parvum*. Demonstration of oocysts in the faeces can be conveniently carried out by the potassium bichromate method (2.5 per cent. solution). Knowledge of the epidemiology of the disease is still scanty. Illness occurs at about the fourteenth day of life, most commonly in May and June. Younger chicks become acutely ill and survivors recover after 3 or 4 weeks and may become carriers of the infection. An account of the symptoms and pathology is given.

The disease is controlled by means of hygienic measures and chemotherapy. The use of wire netting floors, disinfection of poultry houses, etc., is important.

[A good many of the authors statements are at variance with the existing views of British and American authorities].

VON OSTERTAG, R. (1931). Ueber die Bekämpfung der Tierseuchen im Deutschen Reiche. [On the Control of Animal Diseases in Germany.] *Tierärztl. Rdsch.* 37. 113-114.

A short communication in which the author discusses the incidence and control of rinderpest, foot-and-mouth disease, anthrax, malignant oedema, rabies and tuberculosis in relation to the existing legal measures in Germany. He discusses his method for the eradication of bovine tuberculosis.

———. (1931). Report of the Special Committee of the American Veterinary Medical Association on Communicable Diseases of Swine. *J. Amer. Vet. Med. Ass.* 78. 363-366.

PARASITIC DISEASES. The committee recommends that each State should make a survey to determine the occurrence, distribution and losses from parasites and should employ at least one competent parasitologist for research. The U.S. Bureau of Animal Industry have made progress in relation to knowledge concerning the mode of transmission of lungworms, kidney worms, etc.

INFECTIOUS ABORTION OF SWINE. In view of the increasing importance of this disease, the Committee recommends that all practitioners engaged in swine practice should make proper enquiries as to the prevalence of abortion and report the result to the State live stock sanitary officials; and that the Bureau of Animal Industry and State Experimental Stations should increase and intensify their studies into this disease, including its relation to abortion in other animals and its transmissibility to man.

HOG CHOLERA. Few outbreaks occurred last year and fewer pigs were immunised, probably owing to the trade depression; in consequence, a vast proportion of the pig population is now susceptible. There is a decrease in the number of "breaks" in immunity reported and the Committee

ascribes this to the greater care exercised by practitioners with regard to indications and contra-indications for the use of virus.

For the control of hog cholera the Committee recommends :—

1. That States which have not already done so should make hog cholera a reportable disease.
2. That the Bureau of Animal Industry and State Experimental Stations should continue to study the disease, especially with regard to:— (a) ways in which infection is spread, (b) its relation to other diseases which interfere with the success of immunisation and (c) the relation of feeding to immunisation.
3. That the shipping of infected hogs to public marts be discouraged and that strong regulations to cover shipping be made by States, etc.
4. That "rendering" plants, not under federal meat inspection laws, be required to hold a permit and to operate under State live stock sanitary officials.
5. That all garbage feeding plants be operated under similar supervision.
6. That farmers be encouraged to raise their own feeder stock and so reduce the introduction of new stock.
7. That, in view of the difficulties in the diagnosis of swine diseases, only qualified veterinary surgeons should be allowed to carry out simultaneous immunisation.
8. That practitioners should give their clients proper advice concerning the manner in which hog cholera can be avoided.
9. That the simultaneous method of immunisation be recognised as the best for controlling the losses from the disease.
10. That pig rearers should be instructed in the prevention of subvirulent infections which lower vitality but do not kill.
11. That all concerned should give proper attention to sanitation and quarantine.
12. That systematic immunisation should be resorted to in suitable localities.
13. That veterinary practitioners should perfect their technique.
14. That State authorities should control the use of virus through permits and should investigate storage facilities and prevent the use of out of date products by the use of a suitable system of labelling.

A list of measures necessary in order to minimise the occurrence of all the more important pig diseases is given.

STUHLLENMILLER, M. (1931). Die Geissel der Rinderstalles. 700 während eines Jahres behandelte Fälle von Unfruchtbarkeit des Rindes. [**The Scourge of Byres. 700 Cases of Sterility in Cattle Treated in the Course of One Year.**] *Münch. tierärztl. Wschr.* 82. 153-157 & 167-170.

The cases are described from the clinical point of view under two headings:— (a) sterility due to contagious diseases—tuberculosis, bovine contagious abortion, *B. coli* the paratyphoid group, streptococci, spirilla, trichonema infections and infectious vaginitis—and (b) sterility due to non-contagious diseases—anaphrodisia due to persistent *corpus luteum*, anaphrodisia due to the formation of cysts in the Graafian follicles, non-occurrence of *æstrum* due to *pyometra*, sterility due to a starvation diet, sclerosis of the oviducts and pathological-anatomical changes in different parts of the genital tract and nymphomania. Methods of control and prevention are discussed.

SORDELLI, A., PRADO, & FERRARI, J. (1931). Études sur l'hémoglobininurie des bovidés. Complexité de la flore anaérobie de la lésion hépatique. [**Studies on Bovine Haemoglobinuria. Complexity of the Anaerobic Flora of the Hepatic Lesion.**] *C.R. Soc. Biol. Paris.* 106. 142-143.

SANZ found *Cl. welchii* and an unclassified facultative anærobe in the livers of cattle affected with hæmoglobinuria in Chile. WAWTER and RECORDS stated that hæmoglobinuria of cattle in Chile is identical with bovine ictero-hæmoglobinuria in Nevada in which they found *B. botulinus*, *B. oedematiens*, *B. histolyticus*, *B. welchii* IV and other organisms.

The latter authors stated that *Cl. hæmolyticus bovis* is the actual cause of bovine ictero-hæmoglobinuria. SORDELLI, PRADO and FERRARI found a bacillus similar to this organism in four cases of

hæmoglobinuria and, in another case, they found two types of *B. welchii*. They have reproduced the disease with the former bacillus and have recovered it from the lesions along with secondary invaders. They examined four cultures of organisms isolated by SANZ and found that three of them were similar to the one they had themselves isolated.

GAIGER, S. H. (1931). **Bovine Pneumonia: Is it identical with Hæmorrhagic Septicæmia (Barbone)?** *Vet. Rec.* **11**. 171-172.

During recent years various writers have recorded what they believe to be outbreaks of hæmorrhagic septicæmia in Britain. In most of these instances the diagnosis has been based on the isolation of bipolar bacilli, but it is hardly necessary to say that the mere isolation from a carcass of organisms belonging to the pasteurella group is not in itself sufficient evidence of the existence of hæmorrhagic septicæmia. GAIGER and others who have had experience of hæmorrhagic septicæmia in the East are of the opinion that the disease has not been proved to exist in this country.

He points out that, in hæmorrhagic septicæmia, bipolar bacilli can be seen in blood films taken either during life or after death and, furthermore, that the organisms can be readily obtained in pure culture from the blood. In bovine pneumonia, the disease which is apparently being confused with hæmorrhagic septicæmia, blood films are negative and bipolar bacilli can only very rarely be obtained by blood cultures.

Subcutaneous œdematous swellings in the neck and ventral surfaces of the thorax and abdomen are almost pathognomonic of hæmorrhagic septicæmia but these are absent in bovine pneumonia.

Finally, the bipolar bacilli of hæmorrhagic septicæmia are highly virulent, whereas the strains isolated from cattle in Britain are of low pathogenicity.

In view of these contrasts GAIGER is of the opinion that bovine pneumonia, investigated by JONES and LITTLE in America and by TWEED and EDINGTON in Britain, is clearly differentiated from the classical hæmorrhagic septicæmia of the East.

The use of the term hæmorrhagic septicæmia for such outbreaks of pneumonia is, therefore, both inaccurate and confusing.

SHILLINGER, J. E. (1931). **Veterinary Problems on Fur Farms.** *J. Amer. Vet. Med. Ass.* **78**. 12-18.

This is a short paper in which the author describes the requirements of a fur animal farm with regard to the site, structure of the kennels, etc. Silver foxes and other fur-bearing animals are subject to encephalitis caused by a filter-passing virus, to paratyphoid infection, lungworms, hookworms and ascarids, and to external parasites such as fleas and ear mites.

Small wounds in silver foxes are very liable to become infected and this causes serious damage to the fur.

The author advises that at least half the ration should consist of meat or other animal products and that it should include bone meal to provide the necessary calcium and phosphorus.

MAC KAY, Eaton M., & POLLAND, W. Scott. (1931). **Compensatory Hypertrophy of the Spleen.** *J. Exp. Med.* **53**. 317-324. [11 refs.]

The authors amputated half the spleen in several albino rats and in rabbits and killed them afterwards at different intervals. They exposed the spleens of other animals by laparotomy and kept them as controls. By weighing the halves of the spleens removed and the halves left *in situ*, the authors found that a definite hypertrophy occurred in rats but not in rabbits.

The cause of the difference in the results obtained in the rats and rabbits was not clear and the authors consider that an infection of the rats with *Bartonella muris* may have provided the stimulus for the hypertrophy of the spleen remnant; this reaction reached its maximum within 10 days after the partial amputation.

VALADE. (1930). Physio-pathologie des œdèmes. [**The Physio-pathology of Œdemas**]. *Rec. Méd. vét.* **106**. 513-525.

The author defines œdema as the infiltration of a connective tissue by a liquid the characters of which vary. He says, however, that in view of recent research in connection with physical chemistry and biology, a more exact definition is "œdema is a disturbance of the metabolism of water."

Œdemas have been classified in a variety of ways but the author prefers the form suggested by GOVAERTS at the 19th French Medical Congress of 1927 which is as follows:—

- | | | |
|----------|---|---|
| Group 1. | { | 1. Inflammatory œdemas. |
| | | 2. Toxic or toxi-infective œdemas. |
| | | 3. Vaso-motor or angio-neurotic œdemas. |
| Group 2. | { | 1. Mechanical œdemas due to stasis. |
| | | 2. Cardiac œdemas. |
| | | 3. Nephritic œdemas. |
| | | 4. Cachectic œdemas. |
| | | 5. Famine œdemas. |

Alterations in the capillary endothelium occur in the œdemas of the first group and the liquids are highly albuminous. The œdemas of the second group are poor in proteins.

The factors which play a part in the production of œdema may be grouped as follows:—(1) cardiovascular, (2) nervous, (3) humoral, (4) cellular and (5) the lymphatic circulation.

These factors are considered in turn and the author summarises the theories that have been put forward in connection with each.

The author discusses the humoral factor in the following terms:—(a) retention of chlorides, (b) the effect of the osmotic pressure of proteins, (c) the effect of disturbance of the endocrine secretions and (d) the effect of the nature of the ions.

In connection with the cellular factor, the author considers disturbance of the acid-base equilibrium and the effect of the lipid contents.

ALLARDYCE, J., FLEMING, R. H., FOWLER, F. L., & CLARK, R. H. (1930). **Blood Normals for Cattle. Some Pathological Values.** *Canad. J. Res.* **3**. 120-134. [11 refs.]

The authors made estimations of the blood of 21 dairy cows, taking samples for the purpose from each cow for about 6 months. The amounts of the following substances were estimated and recorded in tabular form in mgs. per 100 c.c. of blood:—cholesterol, sugar, non-protein nitrogen, urea nitrogen, amino-acid nitrogen, creatine, creatinine, calcium, inorganic phosphorus and chlorides. The methods of analysis used for each substance are given and the results show that the values in dairy cattle approximate to those found in man.

The cholesterol content showed greatest variation; it became lower towards the end of pregnancy and increased after parturition; it varied according to the diet, increasing when a change was made from corn to sunflower ensilage.

The blood of 25 cattle which had been or were still affected with *hæmaturia vesicalis* yielded normal amounts of these constituents as also did the blood of certain cattle affected with tuberculosis, contagious abortion, blood poisoning and malignant growths. In a case of pyelonephritis there was a great change in all the constituents of the blood.

SCHLOTTHAUER, Carl F. (1931). **The Incidence and Types of Disease of the Thyroid Gland of Adult Horses.** *J. Amer. Vet. Med. Ass.* **78**. 211-218.

The author examined the thyroid glands and other organs of 100 horses ranging in age from 2 to 28 years which had been destroyed because of conditions rendering them unfit for work.

Macroscopical and microscopical examination of the thyroid gland enabled him to place the cases in four groups:—normal, hyperplastic, colloid and adenomatous. The first group comprised 34 cases. The ratio of the weight of the glands to the body weight was 0.02 to 0.06 gr. per kg. In

all cases in which the weight exceeded 0.07 gr. per kg., the glands were found to be abnormal. The average weight of the glands was 23 gr.

The second group comprised 20 cases. The average weight ratio was the same as in group 1 but the maximum weight ratio was 0.08 gr. per kg.

All the glands in this group were more than moderately hyperplastic. Most of the acinar cells were highly columnar and the acini were either devoid of colloid or contained colloid which stained faintly. In 13 of the cases the gland capsules were thickened and, in 15 of them, the vessels had thickened walls and were engorged.

The third group comprised 9 cases. In size the glands ranged from 0.05 to 0.14 gr. per kg., the average being 0.08 gr. Histologically these glands showed abnormal amounts of colloid. The walls of the acini were thin and lined with flattened cells. The average weight of the glands in this group was 48 gr.

The fourth group comprised 37 cases. The glands were definitely adenomatous and, in the great majority of them, the lesion was visible to the naked eye. Microscopically the lesions differed slightly in structure.

Sex appeared to have no apparent significance in the incidence of disease of the thyroid, but the youngest animal in which adenomatous tissue was found was ten years old.

The general condition of the animals was noted in all cases and an analysis of the results obtained shows that the percentages with recognisable poverty of condition ranged from 11 to 40 per cent. The majority of the animals in poor condition were in the fourth group.

SCHALK, A. F., & HAWN, M. C. (1931). **An Apparently New Respiratory Disease of Baby Chicks.** *J. Amer. Vet. Med. Ass.* **78**. 413-423. [2 refs.]

The authors describe an acute, fatal, respiratory disease which appeared to be confined to chicks between 2 days and 3 weeks old. The resistance of the chicks increased with age and those over three weeks old were immune. The disease was widespread in some of the Central North American States during the spring of 1930. In the field the infectivity varied between 25 and 75 per cent. and 40 to 90 per cent. of the infected chicks died. Gasping symptoms and a peculiar coarse chirp were commonly observed between the 5th and 9th days of illness.

The condition was frequently complicated by *B. pullorum* infection. Pathological changes included an acute congestion of the lungs and the presence of a considerable amount of sero-mucoid exudate in the bronchi and bronchioles and sometimes in the nasal passages. Berkefeld filtrates of these respiratory exudates were pathogenic for 60 per cent. of young chicks when inoculated subcutaneously or intra-abdominally, but only a small percentage of adult fowls were infected with the filtrates and the reactions were very mild in all cases.

As a preventive treatment the inhalation of the fumes of menthol, oil of eucalyptus and guaiacol, is recommended, together with strict hygienic measures.

STAFSETH, H. J. (1931). **Fowl Paralysis and the "Roup Complex."** *J. Amer. Vet. Med. Ass.* **78**. 423-429.

Present day knowledge throws little light on the etiology either of fowl paralysis or of roup. It is questionable whether fowl paralysis is an infectious disease and the author emphasises the need for further research to determine its cause, its relationship to coccidiosis and tape worm infections, the possibilities of egg transmission, the part played by heredity and the exact significance of histological changes found in the nervous tissues.

Roup is a typical coryza, with the characteristics of a contagious disease; the cause may be a filterable virus or it may be polymicrobial in nature. In diagnosis, fowl pox and laryngotracheitis must first be eliminated; the former disease may occur as a complication of ocular roup. There is no specific treatment and prevention is chiefly a matter of hygiene; the author describes a field experiment with 1,000 chickens in which the use of bacterins appeared to bring about an earlier recovery than is usually the case in outbreaks of the disease.

MCGAUGHEY, C. A., & DOWNIE, A. W. (1930). **Fowl Paralysis in England.** *J. Comp. Path.* **43**. 161.

In a previous publication (42. 63-76) the authors stated that fowl paralysis had not hitherto been recorded as occurring in the British Isles. They had, however, overlooked a paper by GALLOWAY in the *Proceedings of the Royal Society of Medicine*, **22**, 1167, in which reference was made to the condition.

POISSON, H. (1931). Parasitisme multiple et cachexie chez un poulet. [**Multiple Parasitism and Cachexia in a Fowl.**] *Bull. Soc. Path. exotique.* **24**. 167-168.

A fowl which died in a very emaciated and anæmic condition was found to contain 5 *Syngamus trachealis* in the trachea and more than 300 *Acuaria spiralis* in the proventriculus and gizzard as well as *Ascaridea perspicillum* [*A. lineata* or *Heterakis gallinæ*?], *Hymenolepis carioica* [*Hymenolepis carioica*] and *Trichisma retusum* [*Capillaria retusum*] in the small intestine. The proventriculus was intensely inflamed.

CRAIG, J. F., & KEARNEY, W. (1931). **Gout in Poultry.** *Vet. Rec.* **11**. 299-301.

The authors have met with 100 cases in chickens and turkeys in which a substance mainly composed of sodium urate was deposited on the visceral serous membranes and sometimes even in the substance of the kidneys, liver and spleen. The disease never appeared as an epizootic and it was not found possible to transmit it by inoculation or by contact experiments; this would indicate that the cause is some non-infective agent which acts either by increasing the production of uric acid or by preventing its disposal by the kidneys. The increase in uric acid might be due to excessive nitrogenous diet or to increased katabolism in the animal tissues.

SAINTON, P., & SIMONNETH, H. (1931). Hyperthyroïdisation familiale chez les gallinacés. [**Familial Hyperthyroidisation in the Gallinacæ.**] *Rev. Path. comp.* **31**. 346-353. [3 refs.]

Using 2 chickens as controls, the authors experimented on 4 chickens and one cock to test the possible effect of the administration of thyroid extract to them and to their offspring. All the birds were 6 months old and were of a black feathered variety; they were kept in pairs under ordinary conditions the cock being changed every 2 weeks from one test pair to the other. Dried extract of delipoided thyroid was given *per os* in tablet form in a dose of 0.3 grammes every second day or 0.3-0.6 grammes every day. All the birds continued to grow normally and appeared to remain healthy. Bleaching of the feathers began to occur in all the treated birds from the 15th to the 40th day after the first dose of thyroid extract. Egg laying was not affected and fertility was normal. Five chickens hatched by a hen all showed depigmentation of the feathers even when only a few days old and the process extended and became stabilised at the age of 3 months. Two of these chickens were dosed with 0.3 g. of the thyroid extract daily, but this did not hasten the bleaching nor did it affect their health.

The authors discuss the possibility that the feather bleaching in the chicks was due to the mechanical passage of some hormonal substance from the hen to the chick in the egg, or to an acquired modification in the function of the thyroid gland.

In a discussion which followed the paper various theories were advanced to explain the cause of the bleaching of the feathers. Various methods of control and diagnosis were suggested.

AYNAUD, M. (1931). Kystes a démodex, kystes sébacés et abcès du mouton. [**Demodectic Cysts, Sebaceous Cysts and Abscesses of Sheep.**] *Ann. Inst. Pasteur.* **46**. 306-319. 4 text figs. [5 refs.]

This is the author's second publication on the subject of demodectic cysts in sheep. Many more cases have now been seen and the cysts are here described in some detail. Although their detection during life is a difficult matter, they can easily be seen on the under side of a freshly removed skin, or in leather in which they appear as small nodules or as places where substance has been lost;

and as, in addition to this, the colour of the leather is changed, the condition is of direct economic importance.

Sebaceous cysts which are macroscopically indistinguishable from those containing *Demodex* have also frequently been found. These are described, but although often found in the same subject, it is concluded for various reasons that they are not caused by *Demodex*.

Superficial abscesses frequently occur in the same subject as demodectic cysts; they contain staphylococci and occasionally the Preisz-Nocard bacillus. The author concludes, however, from his observations, that these organisms cannot be the only etiological factors; he surmises that the abscesses, as well as the sebaceous cysts, are hereditary conditions which it is impossible to investigate completely in the laboratory.

SIMMS, B. T., DONHAM, C. R., SHAW, J. N., & MCCAPES, A. M. (1931). **Salmon Poisoning.** *J. Amer. Vet. Med. Ass.* **78**, 181-195. 2 figs. [21 refs.]

This is a detailed account of the disease as it occurs in a definite area of the United States including the State of Oregon, west of the Cascade Mountains, the south-west part of Washington and north-west California.

Certain terrestrial carnivora alone have been affected with this "salmon poisoning," the exact cause of which is unknown. The fluke worm *Nanophyetus salmincola* Chapin is always present in the intestines of affected animals, but its presence cannot account for the severity of the disease. The fluke is parasitic in the snail *Goniobasis plicifera* var *silicula* and in all the members of the family *Salmonidae*. The distribution of the snail evidently accounts for the localised incidence of the disease. Certain points in the life history of the fluke are as yet unknown. Eggs appear in the fæces of affected dogs as early as the 5th day after infection and, after reaching the outside world, they enter the snail host as *miracidia* where they change to *cercariæ* which in turn leave the snail and, coming into contact with fish (of the family *Salmonidae*), enter them, evidently penetrating at any part of the body. They can become encysted in any of the tissues and, if a dog eats a parasitised fish, the flukes are set free and develop into the adult stage.

The study of the disease in experimental conditions, as well as in natural cases, has failed to demonstrate its nature. The symptoms occur six to ten days after ingestion of infested fish. There is sudden high fever with loss of appetite followed, on the third or fifth day, by conjunctivitis, great thirst, vomiting and diarrhœa or dysentery. The illness usually lasts for about nine days and then ends either in death or recovery. The mortality varies from 50 to 90 per cent. Diagnosis is made from the symptomology and the demonstration of fluke eggs in the fæces. There is no curative treatment.

MONTANES, Jesus Saborido. (1931). Reproduction du Lymphosarcome transplantable de la souris par inoculation de sang et d'organes d'animaux porteurs de la tumeur. [**Reproduction of the Transplantable Lymphosarcoma of the Mouse by Inoculation with Blood and Organs from Animals Affected with the Tumour.**] *C.R. Soc. Biol. Paris.* **106**, 371-372.

The author refers to a previous publication concerning the transmission of lymphosarcoma of the mouse by inoculation with tissues from affected animals. In a series of experiments blood from affected mice was used as the inoculum. In the first series, 5 groups of 5 mice each were inoculated with blood collected from 5 mice showing well developed tumours. In the course of a few weeks, 2 of the inoculated mice became affected.

In the second series, 3 groups of 5 mice were first injected with trypan-blue or lithium carmine and then with blood. Six of the 15 mice developed tumours at the site of inoculation. The tumours were histologically typical and could be carried on in series.

In the course of microscopical examinations of blood films both from infected and from normal mice the author found, in those from the affected mice, cells in the blood which he says may possibly be the infective agent. These cells were apparently identical with those found in tumour films which were also examined.

Inoculations carried out with liver, spleen and kidney tissue of infected mice resulted in tumour production in 4 instances. [It is not stated whether steps were taken to free these tissues from blood prior to inoculation.]

HIERONYMI, E. (1931). Die Band-oder Palisadenstellung der Zellkerne in einem epithelialen Tumor der Haut. [The Ribbon or Palisade Arrangement of the Cells in an Epithelial Tumour of the Skin.] *Deuts. tierärztl. Wschr.* 39. 97-101. 3 plates. [26 refs.]

The author describes an epithelial tumour which arose in connection with the sweat glands of the skin of a dog and in which the epithelial cells had what he calls a rhythmic arrangement. It has generally been held that this rhythmic arrangement of cells is found only in the tumours of mesenchymatous origin in human beings.

A very considerable portion of the paper is devoted to a discussion of the literature on the subject.

The tumour which was closely attached to the skin was about the size of a hazel nut and was freely moveable in the subcutaneous tissues of the neck.

Microscopical examination, under a low power, showed that there was a more or less regular arrangement of the epithelial and connective tissue cells. The epithelial tissues in many places showed a gland-like arrangement. The epithelial cells rested on a basement membrane and ranged from flattened to cubical. The acinous spaces were either empty or contained a hyaline material which stained with eosin. In other places, the epithelial cells were arranged in the form of strings or bands which appeared to be folded repeatedly or even spirally. No explanation of this peculiar arrangement was found.

BAKER, S. L. (1931). Transplantation of a Teratomatous Ovarian Tumour in the Fowl. Production of a Sex Hormone by the Cells of the Transplants. *Lancet.* 220. 742-744. 5 plates [4 refs.]

It has not hitherto been found possible to establish a strain of transplantable fowl carcinoma. The author says, however, that he was able successfully to transplant a teratoma of the fowl's ovary in the first generation of hosts, by intramuscular and intra-abdominal (ovarian region) inoculation of fragments of fresh original tissue. The predominating cells in the original tumour and in the transplants resembled those of the *theca interna* of the ovarian follicles. A sex hormone was apparently produced by these cells which gave rise to premature canalisation of the genital orifice with precocious and abnormal development of the oviduct, the ovary remaining immature.

ANDREWES, C. H. (1931). The Immunological Relationships of Fowl Tumours with different Histological Structure. *J. Path. Bact.* 34. 91-107. 1 chart, 16 tables. [11 refs.]

The author describes a series of experiments carried out to determine whether the blood of fowls affected with certain types of transmissible tumours contains any antibodies that will neutralise the effects of inoculable filtrates of tumours when mixed with them in equal quantities and inoculated one hour later. Three tumours were employed:—Rous No. 1, a quick growing spindle-celled sarcoma; Mill Hill No. 1, a slower growing fibrosarcoma; and Mill Hill No. 2, an endothelioma. Chicks from 4-6 weeks old were employed and, to control individual susceptibility and virus potency, they were usually given 4 inoculations, one in each side of the pectoral muscles and one in each leg.

Thirty-eight normal sera were tested and two showed neutralising properties. The sera of 6 fowls that had been affected for at least 5 months with Mill Hill No. 1 tumour were found to neutralise filtrates of Rous No. 1 and Mill Hill No. 2. The results obtained with sera from birds infected with the Rous sarcoma were not constant. The effect of Mill Hill No. 1 serum on Mill Hill No. 1 virus was not recorded.

BIESTER, H. E., & SCHWARTE, L. H. (1931). Intestinal Adenoma in Swine. *Amer. J. Path.* 7. 175-185. 3 plates. [22 refs.]

The authors describe cases of adenoma of the intestine in 3 pigs killed when in an emaciated state after attacks of infectious enteritis. The lesions took the form of multiple polypoid growths chiefly in the large colon. They appeared to be composed of tissue formed in the repair process following the great damage caused by *Salmonella suipestifer* and secondary invaders. In 4 pigs

experimentally infected with acute dysentery by feeding them with intestinal scrapings and contents from natural cases, the primary condition of epithelial proliferation leading to adenoma was observed. It was found that, after ulceration, the neighbouring mucosa proliferates and begins to cover over the denuded area with functional tissue, i.e., gland containing tissue. Goblet cells are absent from this new tissue and from the adenomatous tissue.

The author considers the physio-pathology of the condition encountered and compares it with similar processes in human and animal pathology.

IMMUNITY.

GRAHAM, Robert, & THORP, Frank, Jr. (1931). **Antigenic Value of Botulinum Toxoids kept One Year at Ice-box Temperature.** *J. Immunol.* **20**. 305-312. 1 table. [3 refs.]

Botulinum toxins, kept at 37° C. to 42° C. for one month after the addition of formalin (0.3 per cent. to 0.9 per cent.), become detoxified but retain their antigenic properties. Detoxified material was kept at ice-box temperature and examined periodically for 12 months. The antigenic properties declined and, towards the end of the period, twice the original immunising dose was required for the protection of guinea pigs.

The authors found no relationship between the rates of detoxification and antigenic decline. The pH value of the ice-boxed toxin media changed from 7.6 to 6.7 in 7 months.

GLENNY, A. T., & BARR, Mollie. (1931). **The Precipitation of Diphtheria Toxoid by Potash Alum.** *J. Path. Bact.* **34**. 131-138. 6 tables. [5 refs.]

Even as early as 1889 ROUX and YERSIN attempted to purify bacterial toxins by precipitation as metallic compounds, notably by adsorption with aluminium hydroxide. In 1926 GLENNY and co-workers (*J. Path. Bact.* **29**, 38) showed that the antigenic value of diphtheria toxoid was much improved by the addition of alum and, later, (*Brit. Med. J.* 1930, 244) utilised this observation in the immunisation of horses with tetanus toxoid. Horses injected with a single dose of 10 c.c. of tetanus toxoid containing 1 per cent. of potash alum often produced several thousand times as much antitoxin as in parallel experiments without the use of alum. The quantity of non-specific material present in alum toxoids for animal use is of no great importance, the whole suspension, toxoid plus alum, being frequently injected. But for immunisation of the human subject, unpleasant reactions frequently follow the injection of crude toxoid and reduction of non-specific material becomes important, requiring a clean suspension of the separated precipitate. In the present communication the authors investigate the preparation of precipitates from crude toxoid. They find that the amount of specific toxoid precipitated varies with the quantity of alum in relation to the volume of a given toxoid, irrespective of the dilution of the mixture or the method of addition. At certain levels of alum concentration the toxoid first precipitated is relatively pure, but becomes associated with non-specific material on standing. The purity of precipitates, expressed as Lf units per mg. of nitrogen (estimated by flocculation with antitoxin), increases as the amount of added alum is increased, but the quantity of aluminium detected in the precipitates decreases.

The quantity of alum required to effect maximum precipitation of specific toxoid varies with the toxoids produced from different types of medium. Although the influence of pH on precipitation requires further investigation, the amount of specific toxoid precipitated by a given quantity of aluminium is independent of the reaction of the mixture within relatively wide limits.

STOLNIKOFF, W. J. (1931). Zur Frage der Beurteilung des Einflusses der Notimpfungen auf den Verlauf eines Seuchenausbruches. [**The Estimation of the Effect of Compulsory Inoculation on the Course of an Epizootic.**] *Berl. tierärztl. Wschr.* **47**. 100-101.

It is as important to form an opinion upon the effect of particular regulations in the control of an outbreak of disease as to carry out those regulations. Available data must be analysed very completely in order to avoid the assumption of incorrect conclusions. There are 4 general methods which may be employed:—(1) comparison between the number of cases of illness and death expressed as a percentage before and after inoculation has been resorted to, (2) comparison between

the percentages of deaths among sick animals in an area where inoculation has been carried out and one in which no inoculation has been performed, (3) comparison of percentages of all cases of illness and all fatal cases between inoculated and uninoculated animals and (4) comparison of the percentage of cases of illness and death among inoculated and uninoculated animals in a place or in a series of places after the inoculation has been completed.

The first method which is the one most generally employed, is by no means infallible and conclusions based upon it are not on a sure foundation. The "epizootic factors," the characters of the infection and variations in the outbreaks, are left out of all consideration. Similar objections may be raised to the second and third methods.

According to the author, the fourth method is the only one that is free from fallacy, that is to say, the comparison of results among inoculated and uninoculated animals, when both groups are under observation in one place from the day that the inoculations are carried out. This method of control is not generally practicable as it is usually the object to inoculate every animal in the unit. But in places where some animals are left uninoculated, it is absolutely essential that rigid comparison be made between the course of events in the inoculated and the uninoculated animals.

METALNIKOV, S. (1931). Rôle du système nerveux et des réflexes conditionnels dans l'immunité. **[The Part played by the Nervous System and Conditional Reflexes in Immunity]**. *Ann. Inst. Pasteur*. **46**. 137-168. 10 tables. [26 refs.]

It is impossible to summarise the contents of this paper in a brief space, but it may be said that the author offers as an explanation of the production of immunity, the theory that the reaction producing the immunity is a reflex one in which the nervous system plays its part. The idea is based upon the work of PAVLOV and his pupils who investigated the actions of glands by the fistula method; these workers showed that glands may respond, not only to mechanical, but also to psychological stimuli which are termed "conditional stimuli"; and the responses produced by these stimuli are known as "conditional reflexes." It is said for example that, when antibodies have been produced in an animal by the use of a suitable antigen, the repetition of the operation of injection, without any injection actually being performed, causes an increase in the antibody production through the intervention of stimulation of the nervous system.

KFOURI, P. (1931). Application chez le cheval de la séroréaction à la résorcine de A. Vernes. **[The Use of the Vernes Resorcin Sero-reaction on the Horse.]** *Rev. Path. comp.* **31**. 338-342. [3 refs.]

The author applied the test, as modified by VERNES, for use in the diagnosis of pulmonary tuberculosis and pneumonia of non-tuberculous origin in a number of horses. These animals were experimentally infected with various pathogenic bacteria by means of the author's special technique for intra-bronchial inoculation. The titre of the sera reactions from the infected horses varied considerably, being high during the active development of the infections and varying with the progress of the pathological changes. A positive reaction occurred with pulmonary tuberculosis and also with other lung infections, both pure and mixed. The results were controlled by tuberculin tests and by *post-mortem* examinations. This test, therefore, has no value in the diagnosis of tuberculous infection as opposed to other infections in the horse.

ROBERTS, Edward F. (1931). **Extirpation of the Antigenic Depôt and Antibody Production.** *J. Immunol.* **20**. 291-304. 5 tables. 1 fig. [13 refs.]

The stimulus necessary to set in motion the mechanism of antibody production has been variously ascribed to a nervous influence, to a reflex action or to the actual transportation of the inoculated antigen by the blood-stream.

The author has carried out a series of controlled excision experiments on the ear of the rabbit, using *B. proteus* as the antigen; the results admit the following conclusions:—

(1) The extent of antibody production is diminished by extirpation of the site 10 seconds after antigenic inoculation,

(2) The antibody production stimulus is due to the transportation of the antigen in the blood stream to make contact with the antibody producing tissues. This movement commences immediately after injection; no antibody is produced if the venous circulation is stopped immediately prior to injection.

(3) One antigenic injection will result in antibody production; further inoculations increase the extent of production but not proportionately, the initial stimulus being the most effective.

TOOMEY, John A., & FRIEDLANDER, S. O. (1931). **Further Experiences with Non-specific Local Cutaneous Immunity to *Staphylococcus aureus*. Local Non-specific Protection.** *J. Exp. Med.* **53**. 363-375. 10 tables. [2 refs].

The authors do not confirm Besredka's claim that specific broth filtrates have bactericidal properties when inoculated locally. They show that the application of non-specific broth compresses to the shaved abdominal wall of guinea pigs for 48 hours prior to inoculation confers the same degree of local cutaneous immunity to massive subcutaneous injection of staphylococci as specific broth applications. Attempts to confer protection by applying compresses after inoculating the bacteria were not successful. Peptone broth, peptone, Liebig's extract and horse serum were successfully used as compresses and water, normal saline, or dry applications gave slight but inconstant protection.

CROMWELL, H. W., & MOORE, M. B. (1931). **Studies on Pollen and Pollen Extracts. 3. Skin Reactions to Pollen Extracts in Rabbits.** *J. Immunol.* **20**. 161-167. 2 tables. [5 refs.].

In papers by RAMSDELL (*J. Immunol.* **15**. 305 & **16**. 509) the use of trypan-blue was described as an aid to the study of immediate skin reactions in albino rabbits and guinea pigs, actively and passively sensitised to horse serum. Passive transfer of skin sensitiveness could be demonstrated as early as the sixth day after treatment of the actively sensitised animal and was more consistent than the test for passive sensitisation by shock. The trypan-blue was given intravenously and was followed by the intradermal injection of the antigen. The reaction consisted in a marked local infiltration of the dye, colouring the site of antigen injection.

In the present paper, the authors use the Ramsdell technique in a study of the immediate skin reactions in rabbits sensitised to pollens, using the shaved abdominal skin as space for several injections. Skin sensitivity to pollen extracts (suspensions of whole pollen of giant ragweed and of timothy) was demonstrated in actively immunised rabbits. The reaction was found to be specific and more delicate than the precipitin test as an indication of an immune response. The localisation of trypan-blue also occurs in the abdominal fluid of the immune animal following intraperitoneal injection of antigen. Passive transfer of skin sensitivity from immune to normal rabbits was accomplished by the use of large quantities of immune serum.

RONCHÈSE, A. D. (1931). Conservation du pouvoir complémentaire du sérum de cobaye. [**Preservation of the Complementary Power of Guinea Pig Serum.**] *C.R. Soc. Biol. Paris.* **106**. 19-20. [5 refs.]

Advocates mixture of the serum at the rate of 1 c.c. with 1.5 c.c. of the following solution:—sodium chloride, 54 g., chinosol (or sunoxol R.A.L.), 0.25 g., distilled water to make up to 1,000 g. Complement treated in this way remains active for 15 to 20 days when kept at ordinary temperatures.

PHYSIOLOGY.

CAMPBELL, Argyll J. (1931). **Gas Tensions in the Tissues.** *Physiol. Rev.* **11**. 1-40. [162 refs.]

A forty page critical survey of the literature of the subject by CAMPBELL of the National Institute for Medical Research, London. The general interest of the subject, and the fact that much of the information is not readily available in the veterinary literature, perhaps justifies a somewhat lengthy abstract with a brief reminder concerning the terminology.

For the phrase "gas tension" it is only necessary to recall Dalton's law of partial pressures which states that, in a mixture of gases, each exerts the same pressure as it would exert if alone present in the volume occupied by the mixture. Thus in an atmosphere of normal barometric pressure, 760 mm. Hg at sea level, with 21 per cent. of oxygen and 79 per cent. of nitrogen, the "partial pressure of oxygen" or the "oxygen tension" would be $760 \times 21 \div 100$, i.e. 159 mm.; and the nitrogen tension $760 \times 78 \div 100$, i.e. 593 mm. When gases are in contact with a liquid, the amounts dissolved vary directly with the partial pressures (Henry's Law) and the solubilities (depending on the nature of each gas and on the temperature), so that the "gas tensions" of the liquid are the same as the "partial pressures" of its gaseous surroundings. Any individual gas, of course, tends to enter or leave solution until equilibrium is established between tensions in solution and tension in surrounding space. In relating "partial pressure" or "gas tension" to actual quantity of dissolved gas, the simple formula $q = kt/p$ is sufficient, where p is the atmospheric pressure, t the gas tension and k the solubility coefficient for the particular gas considered. In the tissues there is, with the exception of the red blood corpuscles, no great storage of gases, so that any gas may be regarded as in solution in extracellular or intracellular fluid and as diffusing in the direction of least tension, with a velocity inversely proportional to its density (Graham's Law) and directly proportional to its coefficient of solubility. It is now generally admitted that the passage of gases through tissues is regulated by these well known gas laws and hence that the velocity of travel depends upon the "gas tension" in the region concerned.

The author commences by pointing out that recent research on tissue gas tensions indicates that the oxygen value is nowhere near nil in a normal resting animal, but that it is always positive to the extent of 20 to 40 mm. in all regions examined, excluding, of course, the lumen of those portions of the alimentary tract in which food decomposition is going on. Earlier belief that the oxygen pressure in certain tissues reached zero is attributed to faulty technique in determination and it is now known that it is impossible to reduce the oxygen tension of the tissues in general, to anywhere near nil, without risk of death. Discussion centres round intracellular and extracellular gas tensions, tensions in physiological secretions and excretions, tensions in the lumen of the alimentary tract, and experimental alterations of tensions.

For air and blood the normal oxygen figures are given as 159 mm. for external air, 106 mm. for alveolar air, 100 mm. for arterial blood and 40 to 50 mm. for venous blood and extracellular fluids, grading down to very low values for the intracellular regions so that oxygen diffuses in the direction of the cells. For carbon dioxide the figure for external air is practically nil; for alveolar air and arterial blood 40 mm. (equivalent to 5.3 per cent. of the pulmonary air at normal atmospheric pressure of 760 mm.); for venous blood 46 mm.; for extracellular fluids and cell interiors it is greater than 46 mm. so that carbon dioxide diffuses away from the cells. Since there is no consumption or production of nitrogen, its tension throughout the blood and tissues is, of course, the same as in alveolar air, i.e. 567 mm. or three-quarters of the atmosphere.

The term "diffusion constant" is defined as the quantity of gas diffusing through 1 sq. cm. surface and 0.001 mm. (1μ) thickness in one minute at a pressure difference of one atmosphere. Diffusion of gases through the tissues is much slower than through india rubber, the diffusion constants at 20° C. being 0.14 for muscle, 0.11 for connective tissue, as against 0.34 for water, 0.28 for gelatin and only 0.077 for rubber. Chitin, 0.013, is very low (structural use by insects). In most tissues, however, the arrangement of capillaries and cells is such that very small distances (measured in μ .) are involved and diffusion times (measured in σ or thousandths of a second) are very short. Hence a single nerve fibre 7μ thick would be adequately supplied with oxygen even when exposed to 0.0001 per cent. of that gas and, since a nerve only requires twice this tension when in action, it is difficult to asphyxiate a nerve. Nevertheless the grey matter of brain is particularly sensitive to reduced oxygen tension. In muscle the fibres are large and oxygen requirements are very high during activity so that the "oxygen debt," contracted during a 200 yards sprint by a 75 kg. athlete, requires about 8 minutes for cancellation by oxygen diffusion.

With regard to "secretion of oxygen" by tissues, the best example (in the animal kingdom) is the swim-bladder of certain Mediterranean fishes which may carry nearly pure oxygen at great depths; and the inside wall of which has been calculated as having an oxygen tension a thousand times greater than that of the capillaries outside. In man and the higher animals no such phenomenon of oxygen secretion has been demonstrated, the oxygen tension nowhere exceeding that of arterial blood.

With regard to the question of life without oxygen, vitality is confined to the lowest forms (anærobic bacteria) and the only multicellular animals which normally exist at zero oxygen tension are certain intestinal worms. For the higher organisms a definite and considerable oxygen tension is required in the immediate vicinity of every cell. With regard to recent work, the term "oxidation-reduction potential" as measured in volts Eh, or expressed as "reduction intensity" rH, should be noted as supplementing the simpler considerations of oxygen tension. FILDES, for example, concluded that the Eh of extra-cellular fluids of the guinea pig was too high for germination of *Bacillus tetani*.

In studying tissue gas tensions the injection of inert gas, usually nitrogen, and subsequent analysis of the diffusion dépôts so created at required sites has yielded much useful information. With this method, oxygen tension has been found to be positive wherever tested, ranging usually from 20 to 40 mm. for the tissues of the higher animals. Observations of subcutaneous gas tensions in various homiothermous animals showed 43 mm. for oxygen and 40 to 52 mm. for carbon dioxide. In any one animal the data remain fairly constant under normal conditions. For poikilothermous animals the subcutaneous tensions depend upon the temperature. For frogs which use the skin as a respiratory organ, the subcutaneous oxygen tension is higher and carbon dioxide tension lower at 3° C. than at 17° C.

In the peritoneal cavity of mammals the tendency is towards an approximation to the gas tensions of venous blood, except where hydrogen, arising from fermentation of food, finds its way from the lumen of the intestine *via* blood and lymph. In a monkey, peritoneal tensions were observed as hydrogen 21 mm., carbon dioxide 46 mm., oxygen 43 mm. and water vapour 47 mm.; the remaining 603 mm. (to make up 760 mm. atmospheric pressure) being chiefly nitrogen.

In the pleural cavity gas tensions vary from those of venous blood during normal circulation to very divergent figures under pathological conditions. The greater the infective process (e.g. thickening or necrosis in the pleural membrane) the higher is the carbon dioxide and the lower the oxygen tension. In pneumothorax with pathological changes, the oxygen may fall almost to zero and the carbon dioxide rise as high as 95 mm.

In secretions the normal gas tensions vary with the nature of the secretion. For freshly formed urine they appear similar to those of bladder and subcutaneous tissue but urine itself may use up oxygen and show a lower figure when voided. Under pathological conditions, hydrogen, methane and sulphuretted hydrogen may appear, chiefly by fermentation (diabetes and cystitis). In the case of pleuritic and peritoneal effusions, fluid from hydrocele, subcutaneous œdema and such pathological conditions, the normal values of 20 to 40 mm. for oxygen and 40 to 50 mm. for carbon dioxide are changed in the direction of reduced oxygen and increased carbon dioxide; the latter sometimes doubled.

For saliva, bile and milk, oxygen tensions are always positive, indicating oxygen in solution.

When considering gas tensions in muscle, various workers have given data ranging from oxygen nil to oxygen equivalent to that of jugular blood. The probable true figure is 40 mm. Hg for resting muscle, down to about 10 mm. for actively working muscle.

With regard to the gases of the alimentary canal, each portion of the tract has its own characteristics, although the gas tensions of the tissues in contact are more constant. Within the lumen the variation is from nearly pure air in the mouth, to much reduced oxygen tension in the stomach, down to nearly anærobic conditions in the large gut; the gases of this last portion being chiefly carbon dioxide, methane and hydrogen, with some nitrogen. The normal non-fermenting stomach of carnivora and omnivora contains only oxygen, nitrogen and carbon dioxide (swallowed air mixed with gases from the membrane). The paunch of ruminants contains both hydrogen and methane as normal products of the fermentation of food, the quantities depending upon the nature of the diet and the bacterial flora; a common composition being 30 per cent. methane, 5 per cent. hydrogen, 60 per cent. carbon dioxide and 5 per cent. nitrogen with traces of oxygen. Intestinal gases arise partly from gases passed on from the stomach, partly from diffusion through the mucous membrane (circulating blood tensions) but mainly from fermentation. Hence within the lumen, oxygen is very low, nitrogen not high, with carbon dioxide, hydrogen and methane predominating; and with sulphuretted hydrogen and methyl mercaptan as derivatives of protein putrefaction. In the actual mucous membranes the oxygen tension is always positive and it is possible that a fair amount of oxygen may diffuse through for floral consumption. Analyses of gases passed *per rectum* in man on a milk diet

show hydrogen (dominant), carbon dioxide and nitrogen, but very little methane. Methane increases on a meat diet or mixed diet and on a vegetarian diet may rise to over half the total (398 mm. tension or 52 per cent. volume). It is estimated that about one litre of gas per day is slowly freed *per rectum* by man. In cattle the figure may be as high as 250 litres of methane, together with carbon dioxide up to 8 per cent. of the total food carbon metabolised. Both carbon dioxide and methane are fairly readily absorbed into the blood stream, hydrogen less readily. Traces of both hydrogen and methane are sometimes found in human breath, although the main path is *per rectum*. In rabbits both gases are freed chiefly *via* the lungs. In the horse most of the methane passes *per rectum*, while about 74 litres of carbon dioxide per day may pass otherwise than by the lungs; about 13 by the gut and as much as 61 by the skin.

In recent work, experimental alterations in tissue gas tensions have been carried out by the injection method, with instructive results. By injecting 200 to 300 c.c. of nitrogen once a week into the abdominal cavity and under the skin of the animal (rabbits, cats, monkeys), long experiments on gaseous exchanges under varying conditions are rendered possible. Apparently tissue carbon dioxide tension remains low, even after considerable acclimatisation to low oxygen tension of inspired air, so that active secretion of oxygen by respiratory epithelium (postulated by one school of thought) can play no significantly useful rôle. Carbon monoxide poisoning lowers tissue oxygen tension more markedly than does a similar loss of hæmoglobin function by hæmolysis or hæmorrhage. Oxygen want, produced by hæmolysis, bleeding, or breathing at reduced oxygen pressure, lowers the oxygen tension in the tissues to much the same degree. Even by extreme procedures, however, it has not been possible to lower this figure below 40 per cent. of the normal value without risk of death; conclusive proof that, under normal conditions, the oxygen tension in the tissues never falls below prescribed minima.

Following exercise or convulsions, the tissue oxygen tension may rise 25 per cent. above normal, probably as the effect of changed pH upon the dissociation of oxyhæmoglobin. In many types of tetany a fall of oxygen tension precedes the onset of contractions. It is suggested that tetany is caused by lack of oxygen in the nerve cells of brain or cord and that convulsions are of value in so far as they are followed by a rise of tissue oxygen tension.

Local temperature changes may increase subcutaneous tissue tension of carbon dioxide and oxygen but increase of metabolism by thyroid feeding is apparently without appreciable influence. Vaso-constrictor substances, such as pituitrin and adrenalin, reduce oxygen and increase carbon dioxide tension in the tissues, especially under the skin. Breathing oxygen at high pressures causes profound increase in oxygen tension and a dangerous level of carbon dioxide tension. Breathing carbon dioxide, up to 30 per cent., does not appreciably affect tissue tension of oxygen but markedly increases carbon dioxide tension. On the other hand, marked hyperpnea greatly lowers the carbon dioxide tension, from about 50 mm. normal down to 8 mm. in the abdominal cavity and 21 mm. in the subcutaneous region.

In whatever way, however, the tissue gas tensions be altered by experiment, return to normal levels occurs when the animal settles down to resting conditions. For all the mammals tested this lies between 20 mm. and 40 mm. Hg for oxygen and about 40 mm. to 50 mm. for carbon dioxide. Every physiological device is used to maintain these levels and an evolutionary significance is attached to the figures by the suggestion of the author that during those geological epochs when the tissues were first shut off from the external atmosphere (or sea), such tensions existed in the ambient air. The observation of PONTING is also recalled, that this same 40 mm. oxygen tension, so common in mammalian tissues, is the "critical tension" for amœboid movement. If the oxygen tension in the surrounding medium is reduced below this, the activity of marine amœbæ decreases.

COLSON, M. (1930). Régénération du sang après la saignée chez le bœuf. [The Regeneration of the Blood in the Ox after Bleeding]. *Rec. Méd. vét.* 106. 476-481.

The author's observations have been carried out in Indo-China and his figures relate to the bovine animals in that country.

The number of red corpuscles in animals of full vigour between the ages of 4 and 6 years is, on an average, 7,000,000 per c.mm. In animals over 8 years old the figure may be as low as 5,000,000

but this is not a constant feature. The author's maximum and minimum figures are 8,900,000 and 4,100,000.

The white corpuscles have been found to average between 7,000 and 8,000 per c.mm. but, as in the case of the red corpuscles, age is an important factor. In young animals the figure may be as high as 12,000 while, in old animals, counts as low as 4,000 may be obtained.

The leucocyte formula of an adult bovine is:—polynuclears 81 per cent., large mononuclears 7 per cent., lymphocytes 54 per cent. and eosinophiles 8 per cent.

In young animals the number of polynuclears is lower and there is a more or less proportional increase in the number of mononuclears.

In bovines which have been bled once, the author finds that the number of red corpuscles is restored in about a week or even less.

Immediately after the animal has been bled there is a large increase in the number of leucocytes and these may even reach a maximum of 18,000 per c.mm. in 6 to 24 hours. After this there is a sudden fall in the number followed by a more gradual decrease to the normal in about 5 days.

A differential count taken 6 hours after bleeding shows that the number of polynuclears is approximately doubled and that the number of lymphocytes is halved. There is also a decrease in the number of eosinophiles.

In the case of animals subjected to a series of bleedings the changes in the blood vary with age.

In animals under 8 years old the changes produced in the number of the red corpuscles are not very marked and the loss is readily made good between successive series of bleedings. Similarly, the number of leucocytes undergoes little change.

When animals over ten years old have been subjected to several series of bleedings at intervals, there is a pronounced fall in the number of red cells in the first series and this loss is not afterwards made good.

The number of leucocytes on the other hand is restored within a fortnight of each series of bleedings.

SHOUSE, S. S., & WHIPPLE, G. H. (1931). **1. Effects of the Intravenous Injection of Colloidal Silver upon the Hematopoietic System in Dogs.** *J. Exp. Med.* **53**. 413-420. [6 refs.]

A continuation of past records upon blood regeneration in dogs following anæmia caused by bleeding. In earlier work (*Amer. J. Med. Sci.* 1928. **175**. 721.) WHIPPLE recorded extreme hyperplasia of the bone marrow on erythrocyte levels, maintained at about one-third normal by repeated withdrawals of blood from the jugular vein.

In the present paper the guiding idea is an attempt to create an aplastic anæmia with great depletion of marrow cells and so to study the life cycle of the red cell under carefully controlled and ideal conditions. A step is taken towards the goal but complicating factors limit the endeavour. Intravenous injection of colloidal silver (collargolum, a crystalline material, Heyden Chemical Co., containing 0.85 per cent. metallic silver) did not produce the aplasia hoped for but rather a distinct marrow hyperplasia. Dogs fed upon kitchen scraps were used and blood changes were followed at regular intervals by hematocrite and by leucocyte count of jugular blood. A single injection of 500 mg. collargol produced congestion, œdema of the lungs and death within 12 hours, but single doses of 200 mg. were well tolerated and total doses up to 1,500 mg. were tolerated if divided and given over a week at suitable intervals.

It is worthy of note that some of the dogs contracted distemper soon after silver injections were begun, probably as a result of lowered vitality from metallic intoxication (in the presence of infection) or from exacerbation of latent disease. The general conclusions are that colloidal silver has no specific action on the bone marrow in dogs but is a systemic poison causing anorexia, weakness, loss of weight, anæmia and death; that hæmolysis follows large doses and that the anæmia is in part due to destruction of red cells in the peripheral circulation; that colloidal silver is deposited as granules almost exclusively in the reticulo-endothelial system; that repeated small injections are followed by hyperplasia of the marrow, never by aplasia, and that massive doses cause death by non-specific intoxication (typical of the heavy metals), involving œdema and congestion of the lungs. An initial increase in the number of erythrocytes and leucocytes may follow the administration of small amounts of collargol, but repeated injections cause considerable anæmia without definite increase of leucocytes or decrease of platelets.

SHOUSE, S. S., & WHIPPLE, G. H. (1931). 2. **Aplasia of Marrow and Fatal Intoxication in Dogs produced by Röntgen Radiation of all Bones.** *J. Exp. Med.* 53. 421-435. [13 refs.]

The main objective in these experiments has been indicated in the abstract of Part 1, above, the line of attack now being through exposure of the bones to Röntgen radiation. Partial success is recorded, limited by the development of a peculiar fatal intoxication which terminated the experiments.

Dogs, selected as healthy and immune to distemper, were used, since any latent disorder was sometimes exacerbated by the experimental treatment. Blood changes were followed by hæmatocrite readings, red and white cell counts and the examination of cover slip smears. Radiation was given under 5 hour amytal anesthesia ($\frac{1}{4}$ grain morphine subcutan. half hour before sodium amytal) on the basis of 40 mg. per kg. body weight, injected at the rate of 10 mg. per minute until sound sleep was induced with reduction of the eyelid reflex. Factors of radiation were:—target skin distance 60 cm., filter $\frac{1}{2}$ mm. copper, 1 mm. aluminium, 200 kilovolts, 35 milliamps, exposure 20 to 80 minutes; whole skeleton radiated but intestinal coils well shielded. An average time of 40 minutes, corresponding to 1,050 milliampère minutes, or three times the human epilation dose, produced acute fatal intoxication. Even a dosage of 700 milliampère minutes was occasionally fatal.

The general findings were:—(1) fatal intoxication without warning on the 8th or 9th day after exposure to radiation; (2) profound leucopenia after 5 or 6 days maintained (about 200 white cells per c.mm.) for 2 or 3 days before death; (3) sudden disappearance of platelets from smears the day before death, an observation related to the life cycle of the platelet; (4) extensive capillary hemorrhæge of recent origin in all organs; (5) great reduction in the substance of the spleen and lymph nodes, germinal centres being visible only as remnants; (6) drop in red cell hematocrite reading from 50 to 40; (7) depletion of all the cells of the bone marrow except connective tissue and fat cells, blood vessel endothelium, phagocytes filled with brown granules and occasional normoblasts.

SHOUSE, S. S., & WHIPPLE, G. H. (1931). 3. **The combined Effects of Colloidal Silver and highly filtered Röntgen Radiation upon the Hematopoietic System in Dogs.** *J. Exp. Med.* 53. 437-445.

The objects of the experiments were the same as in 1 and 2 of the series, abstracted above. In the endeavour to create an aplastic anæmia to study the life cycle of the erythrocyte, the authors injected colloidal silver which produced severe anæmia associated with peripheral blood destruction and marrow hyperplasia. They also found that Röntgen radiation results in anæmia, leucopænia, absence of platelets, bleeding and destruction of marrow cells. In these experiments both methods were combined and the joint effects of colloidal silver and heavily filtered radiation did not differ much from the effects expected from each alone. The individual destructive influences of each were still evident and the combined effects were cumulative in the sense that small doses were more destructive than when either was used alone. The leucocytosis resulting from the injection of the colloidal silver afforded no protection against the terminal leucopænia following the radiation.

MOTTRAM, J. C. (1931). **Effect of Radiation on Macrophages.** *Lancet.* 220. 238-239. [2 refs.]

On the assumption that macrophages may play a rôle in the disappearance of tumours, the author records the effect upon them of β radiation. Advantage was taken of the accumulations of macrophages occurring around Jensen's rat sarcoma and T/63 mouse carcinoma. The tumours were exposed *in vivo* to an applicator of 59 mg. radium element, area 2×2 cm., screen 0.12 mm., for 1 to 2 hours and were then removed at varying periods up to 14 days. The animals were given subcutaneous inoculations of trypan-blue daily in order to stain the macrophages *intra vitam*. After removal the tumours were examined in frozen sections counterstained with carmine. The conclusions are that macrophages after radiation do not take up trypan-blue so freely as do normal macrophages and that about 9 days after radiation, when degenerative changes set in, a local accumulation of macrophages occurs. On the assumption that colloidal preparations (e.g. lead selenide as

used in the treatment of cancer) will be taken up by macrophages in the same way as trypan-blue, the author considers that the data suggest suitable intervals for spacing colloid treatment and β radiation.

HAWKINS, J. A. (1931). **The Skin Reaction produced by Alternations of Heat and X-Ray at various Time Intervals.** *J. Exp. Med.* **53**. 405-411. 2 text figs. [4 refs.]

This investigation [objective indicated by the title] follows on observations which have been previously reported concerning the effect of heat and X-rays on the skin reaction of guinea pigs [*J. Exp. Med.* **41**. 761. & **42**. 785.]. Areas on the abdomen of the same guinea pig were exposed to sub-erythral doses of soft X-rays (30 k.v., 22 m.amps., target distance 27.5 cm., time 10 mins.), to heat of an intensity below the critical dose for burns (flat hollow brass button water-heated to 46° C.) and to both radiations in sequence with various time intervals between. The only effect of exposure to X-ray or to heat alone was a slight scalding of the skin. The areas exposed to both developed persistent burns when one agent followed the other within 8 hours. Scalding developed when one exposure was made a day later than the other; the effect being more marked and more lasting than with either alone, but being independent of sequence of application.

McNEE. (1931). **The Spleen. Its Structure, Functions and Diseases.** *Brit. Med. J.* March 7th. pp. 413-416.

After a review of the ancient theories on the functions of the spleen, the author discusses the present knowledge of its anatomy and the division of opinion on the question of whether the circulation is closed or open. He believes that it can be either; that in man and the higher animals the blood normally passes from the smallest arterial branches directly into the venous sinuses and that an intermittent circulation occurs under certain conditions, active contraction and relaxation of the whole organ emptying the contents of the pulp spaces into the veins.

The spleen is largest during youth and active adult life and BARCROFT has shown that it contracts actively during exercise, heat and emotion. Sudden increase in the red blood corpuscle counts which occurs during asphyxiation by various gases is attributed to the activity of the spleen which is considered to be a store house of blood corpuscles. There is some connection between the functions of the spleen, liver and bone marrow and also between the spleen and the development of immunity, but the physiology of these relationships is unknown.

Human diseases of the spleen are classified and the commoner ones are briefly described.

KLEIN, W. (1931). **Der Jodgehalt und die morphologische Beschaffenheit der Pferdeschilddrüse. [The Iodine Content and Morphology of the Equine Thyroid Gland.]** *Deuts. tierärztl. Wschr.* **39**. 133-135. 2 tables. 5 figs. [5 refs.]

The author describes the examination of 100 thyroid glands. The weight fluctuated from 9.6 to 194 g. with an average of 27 g. The average absolute iodine content was 9548 γ [γ =0.00000 1g.] and the relative iodine content was 460 γ per 1 g. of dried gland substance. The iodine content was higher in geldings than in stallions and mares; this points to some connection between sexual activity and the iodine metabolism. In a thyroid gland with an iodine content above the average, the follicles in the state of rest are distended with colloidal liquid; in a gland with a low iodine content, the follicular space is overgrown with parenchyma. Some thyroid glands are capable of storing up iodine if it is administered *per os* or by some other route, but others do not possess this faculty. This explains some of the failures recorded in the treatment of iodine deficiency by the therapeutic administration of iodine.

MAIGNON, F. (1930). **Système nerveux vago-sympathique, glandes endocrines et régulations fonctionnelles. [The Vago-Sympathetic Nervous System, Endocrine Glands and Functional Regulation.]** *Rec. Méd. vét.* **106**. 577-588.

This paper is a brief review of the functions of the vago-sympathetic nervous system and it

contains certain facts regarding the early history of discoveries connected with the system. The author points out that the separation, as far as function is concerned, of the sympathetic and cranial nerves was made in 1800 by BICHAT who showed that the cranial nerves control the existence of an animal in relation to its surroundings, while the sympathetic system controls what may be called the animal's own internal life, or, as MAIGNON says, the animal's vegetative life.

A somewhat generalised and diffuse consideration is given to the main features of these systems, to their control of various functions and to their condition of equilibrium.

FREI, W., & EMMERSON, M. A. (1931). Wirkungen des Sexualapparates auf Blut und vegetatives Nervensystem. [**Influences of the Sexual Apparatus on the Blood and Vegetative Nervous System.**] *Berl. tierärztl. Wschr.* **47**. 161-164. 4 tables. [19 refs.]

The author points out that, although considerable information has recently accumulated for the human subject regarding the relationship of body zones, other than the sexual organs, to puberty, *œstrus*, pregnancy and lactation, less research has been conducted on the economically important domesticated animals. For instance, in the human female, the pre-menstrual period has been reported as associated with increased blood calcium and diminished potassium: late pregnancy as associated with increase in blood volume, slightly increased hæmoglobin (and erythrocyte count), neutrophilia, lowered sp. gr. of plasma, reduced albumen but increased globulin and fibrinogen, increased magnesium with unaltered or slightly reduced calcium, and a pH indicative of slight acidosis. A brief review of the literature is given, including a few data concerning domesticated animals. In the bovine, for example, STEINKELLNER and BRAUN (*Diss. Wien*, 1925) reported osmotic hæmolysis of erythrocytes as occurring at about 0.60-0.65 per cent. sodium chloride under normal conditions, the figure sinking during *œstrus* but returning to normal if pregnancy does not follow; as falling to 0.40 during the first 3 months of successful pregnancy, ranging about 0.48 at 7 months, a little lower again at delivery, with return to normal when the calf is about 6 weeks old. Parturient paresis of cows is associated with hypo-calcæmia, a phenomenon in which the activity of the mammary gland is involved.

In regard to sexual history, nervous system and endocrine system, the mutual activities are regarded as closely related to the concentration of electrolytes in the cells and body fluids. Special importance is attached to the ratio of sodium and potassium ions to calcium and magnesium ions with regard to alteration and disturbance of function. The relative ionic equilibrium between K and Ca concerns especially the relationship between sympathetic and parasympathetic nerve fibres, K being a vagus stimulant and Ca a stimulant of sympathetic tonus. A preponderance of K ions may be reflected as heightened tone of the uterus, strengthened contractions of involuntary muscle, increased secretions of the alimentary tract and bradycardia. Conversely, increased ratio of Ca to K may increase the tonus of the sympathetics with restriction of the motor and secretory activity of the intestinal tract, with tachycardia and with altered renal threshold for blood sugar. Amongst the endocrine glands, the functions of the thyroids, hypophysis, adrenals, pancreas and germinal glands are regarded as related, directly or indirectly, to the mineral metabolism. A scheme of general relationships between electrolytes, endocrine glands, vegetative nervous system and cell function is offered in diagram form.

In the personal investigations of the authors, variations in concentration of serum calcium, in relation to ovarian function are recorded from 285 animals drawn from general practice, veterinary hospitals and from the Zürich abattoirs. The normal bovine range is fairly wide (about 8 to 13 mg. Ca per 100 c.c. serum) but, by considering individuals in groups, conclusions can be drawn. The authors find a general rise in serum Ca during *œstrus*. One cow followed in detail showed a fall before *œstrus*, a sharp rise during *œstrus*, followed by a drop with a small rise during the "yellow body phase." In general, pregnancy was associated with a fall in Ca. Castration seemed to be associated with a slight fall in the male but rise in the female (cows). Cystic degeneration of ovarian follicle was associated with high serum calcium, a variation brought into relationship with nymphomania and hypertonus of the sympathetic system and clinically reflected as restless behaviour, decrease of appetite, emaciation, depression of milk secretion, and even violent mania in extreme cases. Explanation of the relationship is incomplete and further investigations are suggested, involving inquiry into the mineral balance and calcium content of the tissues as well as of the blood.

Although the differences are small, cystic fluid is richer in Ca than is serum, the content being higher in young cows with small cysts than in old cows with larger cysts.

Comparing bovines examined in winter and summer, the authors state that during the latter season the serum calcium was higher, a point correlated with ultra-violet rays and vitamin D. The concluding general discussion attempts to correlate all the data obtained for calcium with variations in tonus of the sympathetic and para-sympathetic nervous system.

SCHAUDER, Wilhelm. (1931). Ueber die Plazenta des Pferdes in späteren Graviditätsstadien. [The Equine Placenta in the Later Stages of Gestation.] *Deuts. tierärztl. Wschr.* 39. 162-165. [24 refs.]

Gives an anatomical and histological study of the equine placenta during the last two or three months of gestation.

KOCH, W. (1931). Die hormonale Trächtigkeitsdiagnose beim Pferd. [The Hormonal Diagnosis of Pregnancy in the Horse.] *Münch. tierärztl. Wschr.* 82. 69-70. [5 refs.]

A discussion of the recent German and French literature on the subject.

DISEASES RELATED TO NUTRITIONAL AND METABOLIC FACTORS.

TOPLEY, W. W. C., GREENWOOD, M., & WILSON, J. (1931.) The Effect of Diet in Epidemic Infections in Mice. *J. Path. Bact.* 54. 163-176. 7 tables. 4 charts. [14 refs.]

Records dealing with resistance to intercurrent disease of animals supporting life on badly balanced dietaries, indicate a frequently recurring relationship between faulty feeding and susceptibility to disorders not specifically associated with malnutrition. WEBSTER and PRITCHARD (*J. Exp. Med.* 46, 557, & 40, 397) are quoted as indicating a correlation between varying diet and varying resistance, not only to infections, but also to bacterial toxins such as *botulin* and to simple chemical poisons. In his most recent paper, WEBSTER (*J. Exp. Med.* 1930. 52. 931) relates modifications in his normal institute diet to variations in the death rate associated with epidemic spread of mouse typhoid.

In the experiments recorded by the authors the method adopted was that of the closed epidemic, in which mice, infected with a suitable strain of *Bact. aertrycke* by intraperitoneal inoculation, were added to large cages each containing 100 normal mice. Various diets were used in various cages and conclusions were drawn from the happenings over the ensuing sixty days. Mice fed upon a basal diet of whole wheat flour, casein, butter and a salt mixture, showed no noteworthy difference as regards liability to contract fatal infection in comparison with mice on the ordinary laboratory diet of whole oats, milk and water. The addition of an excess of fat, butter, lard, or of a vitamin A concentrate, appeared to act unfavourably upon the mice at risk. The addition of cabbage, carrots or mangolds to the normal diet did not lessen the severity of the epidemic following exposure to infection. If anything, the addition of carrots or mangolds appeared to be unfavourable. On the whole, the experiments were negative in character and no evidence was obtained that any of the modifications in the customary diet so influenced the resistance of the mice as to produce any significant decrease in mortality under epidemic conditions.

ANNOTATION. (1931). Renewed Interest in Vitamin A. *Lancet.* 220. 708. [1 ref.]

A general article justifying annotation for veterinarians owing to the very wide differences in vitamin requirements between man, domesticated animals of economic importance, and laboratory animals used for experimental purposes. It is well known, for example, that the requirements of vitamin C are considerable for the human subject, high for the guinea pig, very low indeed for the white rat and of no practical consequence for adult cattle except where the vitamin content of the milk has to be considered from the point of view of human consumption. In respect to vitamin A, the subject of the *Lancet* article in relation to human medicine, the requirements of cattle are so low that the veterinarian need not consider its absence as a possible cause of disease under any conceivable

system of natural feeding, although experimental deprivation in the white rat promptly leads to growth and xerophthalmia.

In the *Lancet* article, after recalling the general significance of vitamin A as growth-promoting and anti-xerophthalmic factor, vitamin B as antineuritic or beri-beri factor, vitamin C as anti-scorbutic factor and vitamin D as an important factor in the rickets syndrome (a dietary factor replaceable by hygienic exposure to sunlight or ultra violet rays and probably derived from Ergosterol as parent substance), the writer refers to the report of the Medical Research Council for 1929-1930 as indicating a revival of interest in vitamin A. The biochemical experiments on the origin of this vitamin and on its relation to the yellow vegetable pigment, carotene, and the tentative clinical experiments on its value in increasing resistance to infectious diseases, are of particular interest. All clinical experiments on the human subject are of course open to the difficulty of securing really adequate "controls," but with puerperal fever there seems to be some evidence that treatment with vitamin A has both curative and preventive value. Enquiries into its prophylactic value with regard to liability to colds and winter ailments, its value in the treatment of *otitis media* after scarlet fever, in the prevention of sequelæ after the common infectious fevers and in dealing with pneumonia and with rheumatic fever, are all on the investigational programme.

Readers of the *Veterinary Bulletin* need hardly be reminded that, in problems of veterinary hygiene and stock nutrition, the importance of the vitamins is by no means parallel to their significance in problems of human medicine. In consideration of the "avitaminoses," or diseases due to deficiency of vitamin in various animals, sufficient attention is not always paid to the enormous differences in requirements of different mammalian types, or to the fact that superficially similar diseases, often bearing the same name (e.g. rickets, *osteomalacia*) in human and veterinary medical literature, may be very different etiologically.

GOETZE, R. (1931). Ueber die Grastetanie und andere Formen der Tetanie beim Rind. [On Grass Tetany (Stomach Stagers) and other Types of Tetany in Cattle.] *Deuts. tierärztl. Wschr.* 39. 209-213. [11 refs.]

This is a review, chiefly of Dutch and German literature, and a general account of the diseases included under this name. German names for the main condition are Weidekrankheit, Frühjahrskrankheit, Kopfrankheit, Grasseuche, Weidetstanie and Gehirnrückenmarksentzündung der Weiderinder, and the common Dutch name is Kopziekte. "Grastetanie" is chosen as the most convenient term. Several Dutch practitioners have reported the disease in Holland and, in Germany, it appears to be common in Holstein where numerous cases were observed last year.

The disease occurs only in milking cows when they are first put on pasture in spring and cases usually occur in the second week on grass. The incidence of pregnancy or recent parturition has no significance in relation to its occurrence. Cases have been reported in summer and autumn.

The symptoms are characteristic and there are two types of the disease, a mild and a severe form. In mild attacks the animals appear to be unwell and prefer to lie down, usually with their heads stretched out on the ground. The voluntary muscles, especially those of the extensors of the elbows, neck and face, are in a state of tonic-clonic tension. The facial expression is reminiscent of tetanus. Affected animals have difficulty in rising and, after getting to their feet, the muscular cramps become more severe and there is unsteadiness and difficulty in moving. The animals are conscious but lethargic. The temperature is often about 40° C.; the respirations are shallow and frequent; the nostrils are distended and the pulse is small and hard. Digestion is impaired; appetite is more or less absent and diarrhoea follows an initial stage of constipation.

In the severe form of the disease, the symptoms are intensified, the affected animals are found lying on their sides in a state of general tetany and the condition is aggravated by any kind of stimulus.

Affected animals may recover spontaneously in a week or more after a mild attack of the disease, but there may be a loss of 10-20 per cent. in spite of treatment.

From the point of view of differential diagnosis, the disease must be separated from transit fever (Reisefieber, Eisenbahnkrankheit) which it closely resembles. Transit fever occurs most commonly in cows in late pregnancy after being kept for 4-6 hours in railway trucks. Lactation and gestation tetany is also similar to grass tetany but it is due to dietetic errors in stall fed cows. These forms of tetany also have resemblances to osteodystrophic disease conditions but the latter develop

slowly and are characterised by bone and joint changes. There are some marked differences between milk fever and grass tetany and acetonæmia must also be differentiated from them. Acute lead poisoning resembles grass tetany very closely; it can be diagnosed by the demonstration of lead in the urine.

The exact cause of grass tetany is unknown. The ingestion of young meadow grass which has been treated with artificial or natural manure appears to be at the root of the matter. There are alterations in the blood calcium and phosphorus in the affected animals. Excess of protein in the grass is thought to be of importance in some manner not yet understood.

The disease can be prevented by avoiding the over-manuring of meadows and by making a gradual change over from stall to meadow feeding.

For the treatment of early cases, the affected animals should be confined in stalls, starved for a few days and be given 20 g. of hydrochloric acid daily in 5 litres of linseed mucilage by stomach tube. Good hay should be given during convalescence. Udder inflation sometimes cures but is often unsuccessful. SJOLLEMA recommends the intravenous injection of calcium chloride (5 g. per 100 kg. body weight as a 10 per cent. sol. in distilled water). Calcium gluconate is also useful but it should never be given subcutaneously owing to the frequency of local trouble after injection; other preparations of calcium are referred to as being of use.

MANGIAROTTI, A. (1931). L'adrenalina e il calcio nell'collasso puerperale. [**Adrenalin and Calcium in Milk Fever.**] *Glin. Vet. Milano*. **54**. 149-151.

The fact that udder insufflation is not invariably successful in effecting a cure in milk fever led the author to search for some other means of reducing the flow of blood to the udder. He determined to try adrenalin and claims that he obtained brilliant results, not only in nephritis in general and in paroxysmal nephritis in horses, but in *ante-partum* paralysis in cows. He describes a case of milk fever in which the udder had already been inflated unsuccessfully by a quack. When the author was called in he inflated the udder again, but to a greater degree. The animal only obtained temporary relief and twenty-four hours later it was still comatose.

15 grammes of one per thousand solution of adrenalin diluted with an equal quantity of normal saline was then injected into the udder, the amount being divided in approximately equal quantities between the four quarters. At the same time the udder was inflated to a moderate extent. In two hours the cow was up and no further treatment was necessary.

Details are given of the treatment of another case which was able to stand up within half an hour.

The author refers to the work of DRYERRE and GREIG and suggests that a test be made of the administration of calcium *per os* to pregnant cows as a means of preventing milk fever.

MUELLER-LENHARTZ. (1931). Zur Entstehung der Knochenweiche. [**On the Etiology of Osteomalacia.**] *Berl. tierärztl. Wschr.* **47**. 147-148.

Many sporadic and epizootic outbreaks of osteomalacia have occurred in Germany during recent years and, so far, the attempts made to prevent the disease have been attended with very little success. Faulty feeding, extending over a long period, has been one of the etiological factors responsible for the onset of the disease. Ill-balanced diets, poor in mineral bases or containing an excess of acid-forming substances, lead to the onset of the disease, but if noticed in time the trouble caused by such diets can be corrected by giving hay rich in leguminous plants or by the administration of a suitable mixture of mineral salts. Feeding on concentrated foodstuffs, without an accessory mineral mixture, may also produce the disease. Dysfunction of the digestive system interferes with the proper absorption of fat-soluble vitamins. Acute vitamin deficiency, in conjunction with mineral deficiency, produces the gravest effect upon the animal organism. The addition of green fodder and a mineral mixture to a diet consisting of concentrated feeding-stuffs (oil-cake, crushed grain, etc.), supplemented by cod liver oil, acts specifically, not only as a therapeutic agent but also as a powerful prophylactic. It is possible that, in certain localities in Germany, acidity of the soil and its poorness in lime were of etiological importance in some of the recorded outbreaks of the disease.

SCHERMER, S., & HOFFERBER, O. (1931). Ueber den Phosphor- und Kalziumgehalt des Serums osteomalazischer Rinder und über die Heilwirkung des Vigantols. [**The Phosphorus and Calcium Content of the Serum of Cattle Affected with Osteomalacia and the Curative Effect of Vigantol.**] *Berl. tierärztl. Wschr.* 47. 97-100. 3 tables. [13 refs.]

Considerable progress has been made in our knowledge of diseases of the skeletal system, both in young and adult animals, through the discoveries that have been made regarding the calcium and phosphorus metabolism and the part played by vitamin D.

The author describes the investigations carried out on two herds of milch cattle in which there was marked evidence of the existence of osteomalacia. He supplies details of the diets given and the analyses of the animals' serum as regards calcium and phosphorus.

The presence of correctly balanced phosphorus and calcium alone are not sufficient to prevent osteomalacia. It is essential that vitamin D be present.

The cows on one of the two farms had been fed very largely with silage and gradually lost their appetites: a small amount of concentrates had also been given but the whole ration was found to be very poor in calcium and quite deficient in vitamin D. The cows were all in moderate to poor condition, some were too weak to rise from the ground and the food was left untouched in the mangers. They were all giving some milk but none were in calf.

The cows on the second farm were less severely affected. Their diet was similar except that they were each getting 20 g. of calcium phosphate daily which is insufficient for milch cows. There was a total lack of vitamin D.

The author decided to check the proposed treatment by the maintenance of weekly records of blood Ca and P of the cows and, in addition, to find out the values of these minerals in several cows in normal health. The average Ca value of 53 normal cows was 9.9 mg. per 100 cc. and the average P value was 8.3 mg. per 100 cc. (the author considers that the latter is slightly below the normal figure). The blood serum of cows affected with osteomalacia had a very low phosphorus content, but the calcium figure was not markedly low. Treatment consisting of a weekly inoculation with "vigantol," a proprietary preparation of irradiated ergosterin, was given. The course of the treatment and its results are illustrated by 3 tables which concern (1) barren cows from the first farm, (2) barren cows from the second farm and (3) pregnant cows from the second farm. A few cows were given daily doses of "vigantol" *per os*. It was found that intravenous administration gave much the best results.

Most of the affected cows showed great improvement at once and were cured in a short time, even when there was no proper change of diet; when lucerne hay was fed (2 lbs. per day) recovery was even more rapid.

The principles of the treatment of mineral deficiency diseases are discussed and emphasis is laid on the connection between vitamin D and calcium metabolism.

Several cases of "pre-parturient paralysis" in cows (considered by the authors to be in a state of latent osteomalacia) have been cured by vigantol therapy.

SEN, J. N., & HOSSAIN, M. A. (1931). **Experiments on Disintegration of Bones for use as Fertilisers.** *Agriculture and Livestock in India.* 1. 151-155. 3 tables.

An article dealing primarily with the utilisation of bones for agricultural purposes, but of veterinary interest with regard to two points:—(1) the control of diseases transmissible by animal products (e.g. anthrax) and (2) the possible use of such material *per os* in controlling aphosphorosis in stock (e.g. "Styfsiekte" of South Africa, "Cripples" of Australia, "Down in the Loins" of Texas).

The object of the authors is to secure utilisation within India, in the form of fertiliser, of bones now exported to foreign countries. These countries are obviously concerned in obtaining bone products at world prices, but at the same time of evading the danger of the transmission of disease. Readers of the *Veterinary Bulletin* may be reminded that regulations on this matter vary widely in different countries. They are, for instance, very stringent in South Africa where control of importation comes under the veterinary officials and a certificate of sterilisation of bones by prescribed methods acceptable to the Minister of Agriculture is demanded for every cargo. Such points are not specifically dealt with by the authors, who are primarily concerned with the effect of treatment

on manurial values, but most of the methods discussed for converting bones into friable form easily available as fertiliser, do, at the same time, render them safe for transport. The methods discussed are:—(1) subjection to superheated steam, (2) treatment with chemical reagents (acids, alkalis with or without salt), (3) fermentation, (4) calcination and (5) extraction with organic solvents. These are all well known methods of treating bones and, with the possible exception of (3) are generally accepted as incidentally effecting adequate sterilisation. Calcination of course involves manurial loss of nitrogen, and steaming (at 130° C.) involves loss of collagen, giving derivatives of bone and not “bone meal.” Although not discussed by the author, it may be added that the common factory practice of de-fatting bones by benzol vapour, followed by live steam to remove the solvent, gives a clean product suitable both for fertiliser and for animal feeding in the prevention of mineral deficiency diseases.

SPECIFIC THERAPY.

HALL, Maurice C. (1930). *The Use of Drugs in the Treatment of Diseases caused by Worms. J. Comp. Path.* 43. 99-107.

The author points out that the systematic and scientific investigation of anthelmintic medication was neglected up to about 1915, when RANSOM inaugurated research in the United States.

Several factors require consideration in the application of drugs to the treatment of parasitic diseases. The clinician must be fully aware of the nature and actions of the drugs to be used and he must have the fullest possible knowledge of the problem in hand. He must also be capable of forming a sound judgment. The condition of the animal must be carefully considered so that errors, such as instituting treatment when animals are in an unfit state to receive it, may not be made. The habits, location and life history of the parasites must be known in detail. Not only must the drug selected in any particular case be suitable for the particular purpose in view, but full knowledge must be available as to its action upon the host. In the majority of cases a purgative is an essential part of the treatment. This must be selected with regard to its known action in connection with the anthelmintic as, otherwise, it may either afford inadequate protection to the host or may decrease the efficiency of the drug. The dosage and the time of administration of the purgative are of prime importance.

The practitioner must be in a position, not only to treat successfully, but also to give correct advice regarding the prevention of infestation or re-infestation.

The author proceeds to elaborate these guiding points but has of course to limit himself to generalisations.

The method of administration may be as important as the selection of the drug. Santonin is more effective against ascarids in repeated (daily) small doses than when a single large dose is given. In the case of tapeworms, a preliminary saline purgative is advisable.

Fasting prior to treatment is advisable on theoretical grounds and practice has shown this to be sound. It is, however, useless to fast ruminants with a view to reduction of the stomach contents. There appears to be evidence to show that the effects of some anthelmintics may be altered, not by the presence or absence of food, but by the particular kind of food present in the viscera. Thus MINOT and CUTLER find that death may occur in sheep which have been given medicinal doses of carbon tetrachloride when they have been on some diet other than pasture grass. It is said that the carbon tetrachloride leads to guanidine retention. Food should be withheld for a few hours after treatment.

No standardised procedures for the production of purgation after treatment have been developed in veterinary practice as they have been in human medicine, but it must be remembered that purgation is of great importance and that failure to produce it may have serious consequences. Purgation prior to anthelmintic medication is not invariably required. It is necessary in tapeworm infestations in order to clear away the mucus.

In some cases the purgative and anthelmintic can be given together without reducing the effectiveness of either, as in the combination of chenopodium and castor oil. Castor oil reduces the efficacy of carbon tetrachloride. When purgatives are given after an anthelmintic, a rapidly acting saline is generally preferable. The salines should not be given in saturated or concentrated solution.

Liquid paraffin and olive oil are not suitable for use with oil of chenopodium.

In judging the value of an anthelmintic, time must be allowed for the passage of the dead worms. In dogs 98 per cent. of the ascarids are passed within 4 days. In horses treated for bots, about three weeks must be allowed to elapse before an estimate is made of the value of the treatment.

It appears to be a general rule that intestinal worms are removed by drugs with a facility that is in proportion to their size, the larger worms being the more readily removable. The small worms are probably protected by close contact with the mucosa and consequently by the presence of a protective layer of mucus.

———. (1931). **Control of Stomach Worms in Sheep—Administration of Drugs in Drinking Water.** *J. Sci. & Indust. Res. Australia.* 4. 55-56.

At the request of Australian sheep farmers, tests have been carried out by CLUNIES ROSS on the effect of administering drugs in drinking water for the treatment of stomach worms. The drugs tested were potassium permanganate in 1 in 5,000 and 1 in 2,500 solution, copper sulphate in 1 in 5,000 solution and two proprietary preparations. These were supplied to infected sheep in the drinking water daily over prolonged periods which in one case extended to six months, but no beneficial results were observed. A specially prepared suspension of 1 in 4,000 carbon tetrachloride in water was also investigated and appeared to have slight action on the worms; as, however, it was found to have a definitely harmful effect on the liver of the sheep it cannot be recommended, and graziers are strongly advised not to abandon the old, tried methods of controlling these parasites.

LOURIE, E. M. (1931). **The Effect of "Höchst 4002" on *Trypanosoma gambiense* and *T. evansi* in Mice and Rats.** *Ann. Trop. Med. Parasit.* 25. 123-127. 3 tables. [2 refs.]

G. GIEMSA (1929) claimed that "Arsen präparat Höchst 4002" is a valuable trypanocidal agent. He tested the drug (the formula of which has not yet been disclosed) against *T. brucei*, *T. equiperdum* and *T. rhodesiense* in mice and the results were so satisfactory that preliminary tests are being carried out on cases of human sleeping sickness in the Cameroons and on animal trypanosomiasis.

The author failed entirely to confirm Giemsa's conclusions. Not only did he find that the drug was useless as a prophylactic agent, but he failed to obtain any beneficial results with it during the treatment of trypanosomiasis in mice or rats artificially infected with *T. gambiense* or *T. evansi*.

WRIGHT, W. H., BOZIEVICH, J., & UNDERWOOD, P. C. (1931). **Critical Experiments with Carbon Disulphide in the Treatment of Habronemiasis.** *J. R. Army Vet. Corps.* 2. 66-70. [6 refs.]

An account is given of the results obtained from the administration of anthelmintic doses of carbon disulphide to four aged equines infected with *H. muscae*, one being also infested with *H. megastoma*. It was thought that searching the faeces for the recovery of dead worms would be unsuited to experiments with *Habronema* which, because of its situation in the anterior part of the alimentary tract, might become digested before reaching the exterior; the experimental animals were, therefore, killed from 40 minutes to one hour and 40 minutes after the dose had been given, and the viability of worms present was tested with warm water.

In two of the animals a preliminary lavage of the stomach with a solution of sodium bicarbonate was carried out in order to remove some of the mucus and to expose the worms. In these two experimental animals, 386 out of a possible 392 and 8 out of a possible 8 *H. muscae* were found to have been killed by the anthelmintic treatment, while one out of a possible 68 and 17 out of a possible 53 of these worms had been killed in the two animals which were not treated with sodium bicarbonate. 304 *H. megastoma* present in a tumour in one of the animals which received the sodium bicarbonate treatment were not affected. The doses of carbon disulphide varied between 12 c.c. and 24 c.c. and were considered to be adequate. The sodium bicarbonate successfully removed much of the mucus, but it appears to have exercised some protective power on the membrane, as inflammation resulting from the use of carbon disulphide was only evident in the animals from which sodium bicarbonate had been withheld.

The author adds that results which he will publish elsewhere show that *H. microstoma* also responds to this treatment.

CUTLER, Jessie T. (1931). **The Accumulation of Guanidine in the Blood following Acute Liver Injury by Carbon Tetrachloride, Chloroform, Arsenic, or Phosphorus.** *J. Pharmacol.* **41**. 337-345. 4 tables. [14 refs.]

An earlier publication (*J. Clin. Invest.* 1928. **6**. 369) reported that, although dogs on a mixed diet showed high tolerance for carbon tetrachloride, administration to dogs on a diet of lean meat caused a severe and often fatal intoxication, associated with a rise in guanidine in the blood followed by a severe hypoglycæmia. Since the outstanding pathological change caused by carbon tetrachloride is a severe central necrosis of the liver, the present study was undertaken to ascertain whether a similar type of liver injury from other causes would be followed by similar chemical changes in the blood. Chloroform (by inhalation), carbon tetrachloride (*per os*), arsenic (intravenous as arsphenamine) and phosphorus (in olive oil *per os*) were administered in adequate toxic doses, and determinations of guanidine, sugar, non-protein N, urea, creatine, creatinine and amino N in the blood were made at various intervals until the occurrence of death or recovery. The intoxications caused by all four agents were characterised by an increase in guanidine and an accompanying hypoglycæmia. The guanidine increase is probably secondary to the liver damage produced and the belief is expressed that, wherever rapid liver necrosis occurs, guanidine will probably play a part in the resulting intoxication.

EHLERS, G. H. (1931). **The Anthelmintic Treatment of Infestations of the Badger with Spirurids (*Physaloptera* sp.)** *J. Amer. Vet. Med. Ass.* **78**. 79-87. 2 tables.

A disease which resulted in the death of some 20 badgers on a certain fur farm is thought to have been caused by *Physaloptera* sp. It was characterised by a gradual loss of condition and, in the later stages, by the passage of dark, tarry fæces. At autopsy the worms were recovered from the œsophageal end of the stomach in numbers varying from 150 to 200. [No mention is made of lesions produced by the worms].

Treatment with various anthelmintics was tried. Arecoline hydrobromide, santonin, oil of chenopodium and carbon tetrachloride had little or no effect; tetrachlorethylene in a dose of 5 c.c. removed all the worms but killed the badger, while a dose of 10 minims had no action. Carbon bisulphide was very effective and was followed by marked improvement in the condition of the hosts. Out of 22 badgers treated with this drug, only 3 were afterwards found to be infected, while 8 untreated badgers were found to harbour between 15 and 200 worms each. A freshly captured wild badger was examined in order to ascertain whether these worms are present in the wild state; a more thorough search was made than in the diseased badgers and 253 *Physaloptera* sp. were recovered. [It is not stated whether this animal was also diseased].

FOURNEAU, Ernest, & MELVILLE, Kenneth I. (1931). **Studies in Mercurial Chemotherapy. I. Concerning Mercurial Toxicity, its Evaluation Mechanism and Relation to Chemical Constitution.** *J. Pharmacol.* **41**. 21-45. 16 tables. [17 refs.]

Three types of mercurial intoxication were observed:—a hyperacute, fulminant type, fatal within 5 minutes an acute form, with death in 5 days and a chronic form ending fatally in 7—14 days. The authors define a *minimum toxic dose* and compare the results obtained from the intravenous injection of rabbits with various mercurial compounds. They found that toxicity did not seem to depend on the weight of mercury or on the chemical activity of the compound, but rather on the chemical combination of the metal in the salt. A basal water-free diet increased the toxicity.

BECKER, E. (1930). Räudebehandlung durch Begasung bei Rindern und exotischen Tieren. [The Treatment of Mange in Cattle and Foreign Animals by "Gassing."] *Deuts. tierärztl. Wschr.* **38**. 773-779. 8 plates, 1 table. [14 refs.]

Up to 1923 only equines had been treated for mange by "gassing" with sulphur dioxide in the Sarstedt clinique, but in that year it was found that the treatment was equally efficient for cattle. Two exposures were required in order to effect a cure in mild cases and three in severe ones. It was soon found that relapses promptly occurred if cured animals were returned to their own stables. To be effective, treatment must be carried out on all of the animals on the premises as well as on the

buildings themselves. This necessity led to the production of a mobile gas-disinfection apparatus. The apparatus is figured and described and special mention is made of the precautions which have to be adopted to prevent the occurrence of accident or injury. It is in the form of a cabinet in which the animal is placed with its head projecting through a curtain closing one end.

Animals which have been treated with ointment or greasy dressings must be scrupulously cleaned and all fat must be removed from the surface of the skin. For 12 hours prior to treatment only a little hay and a small amount of water should be given so as to reduce the amount of fæces and urine to a minimum.

Milch cows must be milked before treatment so that they do not become restive through the pressure of milk while they are undergoing exposure. In animals that are in poor condition and in fatigued draught oxen, the anus frequently remains open and, in such cases, a greased pad must be held in position by a truss-like bandage to prevent the gas mixture from gaining access to the rectum where it could cause severe irritation.

Arrangements must be made beforehand for housing the animals after treatment as they cannot be returned to the infected stalls. It is not advisable to carry out the treatment during winter when the weather is cold and damp and the days are short. The best times of the year are spring and autumn when the weather is good, the temperature moderate and the days fairly long.

The "gassing" chamber must be kept dry on account of the electric current used for running the gas apparatus.

Special arrangements must be made for the collection of fæces and urine from the animals while they are in the gas chamber, to prevent the flooring from becoming wet.

On one occasion the apparatus became thoroughly wetted by continuous rain and one of the men employed received a serious electric shock as a result.

The animals in an infected herd must be treated three times at intervals of a week. The head which is not subjected to the action of the gas, must be carefully hand dressed with an effective dressing.

The whole labour of treating the animals is wasted unless the standings or stalls are effectively cleansed.

Animals with heavy coats or wool must be shorn before treatment.

ARNOLD, T. F. (1931). *The Preparation and Use of Spleen Extract*. *J. R. Army Vet. Corps.* 2. 131-134.

The author prepares a spleen extract and adds 0.5 per cent. phenol and 0.005 per cent. acriflavine for preservative purposes. He obtains good results in the treatment of certain skin and foot diseases and in the treatment of diarrhœa. He gives 5 c.c. of his extract subcutaneously every 5 days to horses and mules.

VOGT-MULLER, P., & BAY, F. (1931). *On the Treatment of Sterility in Cows with Wheat Germ Oil (Vitamin E)*. *Vet. J.* 87. 165-170. [13 refs.]

This is a preliminary note from Denmark where the authors have been working for years on the relationship between vitamin E and reproduction in rats and mice. This vitamin, present only in vegetable oils, is richest in wheat germ oil which was used by the authors when carrying out experimental treatment of sterility in dairy cows. The cases selected had failed to conceive and were free from clinical evidence of genital disease. The oil was extracted by a method which is described and it was given intramuscularly to 12 cows in a dose of 10 c.c.; 10 of the treated cows became pregnant. Encouraged by this result, the authors are planning further experiments.

MINERAL AND PLANT POISONING.

SCHAPER & LUETJE. (1931). *Kupfervergiftungen unter Schafen und Rindern nach Bekämpfung der Obstbaumschädlinge mit Kupfersulfatlösungen in Jahre 1928*. [*Copper Poisoning in Sheep and Cattle after the Control of Fruit Tree Pests by Copper Sulphate Solutions*]. *Berlin. tierärztl. Wschr.* 47. 36-39 & 49-54. 2 tables. [4 refs.]

This is an exhaustive account of a large number of cases of copper poisoning occurring in about 600 sheep which were turned out to grass in fruit orchards where the trees had been sprayed with

fungicide solution made up of copper sulphate and slaked lime. About 15 per cent. of the sheep on the fruit farms became affected as also did a few cows and calves. Two outbreaks occurred, one in 1927 and a more severe one in 1928, on farms situated on the lower course of the river Elbe. On most farms the trees were sprayed 3 times—at the beginning of March, in the middle of May and in June; the majority of deaths of sheep occurred in July of the 2nd year.

In 1927, the spraying had not been carried out very intensively and a phenol preparation had been used before the copper solution. The trouble in that year was ascribed to phenol poisoning.

The severe outbreak of 1928 called for a thorough investigation and a chemical analysis of the organs of dead sheep showed that copper was present in sufficient quantity to account for the deaths.

Both acute and chronic cases occurred: in the acute type of illness, death took place rapidly with accelerated pulse and respirations, fever and gastro-enteritis; there was also great thirst. Chronic cases first showed œdema and eczema of the ears (this condition being well-known locally to the farmers as "leckohr") and œdema of the throat and cheeks which tended to disappear after some days. There was also progressive emaciation and anæmia and usually icterus. Hæmorrhagic nephritis was often present and was manifested by hæmoglobinuria and hæmaturia; this symptom is of value in the differential diagnosis from distomatosis. Affected sheep became unsteady on their hind limbs and this was probably due to the nephritis; no muscle changes were found on *post-mortem* examination.

The great thirst of the sheep often led to their death by drowning in steep sided brooks out of which they were too weak to climb.

Skin changes and loss of wool, especially from the back regions, were also common in the sheep.

There were a few deaths in cattle but they were not preceded by the same train of symptoms; diarrhœa was the only symptom observed before death. The rather sudden deaths in the cattle led to a suspicion of anthrax.

Post-mortem examination of affected or dead sheep showed generalised icterus and œdema, degeneration of the liver, hæmorrhagic nephritis, myocarditis and an increase in the lymphatic elements of the spleen. The stomach and the small intestine showed great inflammation. The kidney condition was characteristic, the organs usually being dark red and of a friable consistence. The mucous membrane of the bladder often showed swelling and was of a yellowish-brown colour; the urine was opaque and contained blood debris.

In a few of the cattle examined there was acute gastro-enteritis (affecting the abomasum and small intestine); there was slight degeneration of the liver but the kidneys were not greatly altered. Neither hæmoglobinuria nor skin changes were observed.

The authors review the literature on copper poisoning and point out the lack of agreement about symptoms and *post-mortem* changes as described by various authors; they refer to work of ELLENBERGER and HOFMEISTER (1883) and of BAUM and SEELIGMANN (1898) who performed careful experiments on chronic copper poisoning in ruminants.

NEUMUELLER. (1931). Schädigungen von Hühnern durch Behandlung mit Natrium-fluoridsalbe anlässlich der Vertreibung von Federlingen. [**Losses among Hens caused by Sodium Fluoride. Treatment for the Extermination of Lice.**] *Deuts. tierärztl. Wschr.* 39. 166-167. [5 refs.]

German poultry breeders have reported many losses after the treatment of louse-infested hens with sodium fluoride.

The author found that the drug had been rubbed vigorously into the skin instead of being dusted on and between the feathers. He describes the correct method of treatment.

GILRUTH, J. A. (1931). **Caustic Vine** (*Sarcostemma australe*) as a Poison Plant. *J. Sci. & Indust. Res. Australia.* 4. 58-60.

A sample of a plant was sent for identification by a farmer who thought it had poisoned some sheep. It was identified as *Sarcostemma australe* and was tested for toxicity by dosing a sheep with half a litre of the supernatant fluid obtained by steeping the dried plant in water for two and a half days. Twenty hours after receiving the dose the animal was very ill. It was found lying on its side with its neck bent back and the abdomen was distended. The legs were making paddling movements,

respirations were stertorous, the jaws were clenched and the lips and nostrils were covered with frothy saliva. The temperature rose to 106.2° F. during the course of the illness; shortly before slaughter there was a general muscular stiffness.

The sheep was killed 29 hours after being dosed. The only abnormalities found at autopsy were clear pleural and pericardial exudates and signs of paralysis of the stomach and intestines. The poison was considered to act on the central nervous system.

HENDRICKSON, J. M., & HILBERT, K. F. (1931). **Pokeweed Berries not Poisonous for Chickens.** *J. Amer. Vet. Med. Ass.* **78**. 556.

Although it has been known for some time that the roots and fresh shoots of pokeweed (*Phytolacca decandra*) are exceedingly poisonous for swine, there are no authentic records in the literature of the supposed toxicity of the ripe berries of this plant for poultry. In order to settle this question, the authors fed large amounts of ripe berries to 5 chickens and one duck over a period of nearly 3 weeks. There were no untoward effects. As a result they conclude that the ripe berries of this plant are not toxic for chickens.

McLAUGHLIN, Alvah R. (1931). **Studies Upon *Astragalus campestris* a Poison Plant.** *J. Amer. Vet. Med. Ass.* **78**. 225-228.

The author refers to losses among cattle and sheep in Wyoming and Northern Colorado which were attributed to the ingestion of *Astragalus campestris*. The sheep frequently succumbed to pneumonia and the cattle showed inco-ordination of the hind limbs.

BRUCE studied a similar condition in Canada and concluded that a plant—subsequently identified as *Astragalus campestris*—is the cause. The description in the present paper of the symptoms presented by cattle and sheep, is extracted from Bruce's publication (*Agr. Bull.* **88**. Canada (1927)].

BRUCE found that lactating ewes and cows were more often affected than males and non-lactating animals. He described two types of the disease—a type characterised by inco-ordination of movement and a "laryngeal" type, the latter apparently being due to a varying degree of paralysis of the respiratory organs.

He found that the lesions in affected animals were:—broncho-pneumonia, a flabby condition of the heart, an increase in the amount of pericardial fluid and nephritis.

McLaughlin's experiments were carried out on rabbits, dogs and sheep with alcoholic extracts of the dried plants in the pre-flowering, flowering and seeding stages. All the extracts proved fatal to rabbits which developed lesions of irritant poisoning accompanied by congestion of the lungs.

Kymograph records showed that injection of the extract had a depressant action upon the respiratory centre.

MARCZEWSKI, M. (1931). **Zatrucia starcem jakóbkciem (*Senecio jacobaea*, u) Cydta i Koni. [Ragwort (*Senecio jacobaea* L.) Poisoning in Cattle and Horses.]** *Wiadomosci Weterynaryjne.* **127**. 68-72. [6 refs.]

A compilation written from the publications of modern British authors.

SMYTHE, R. H. (1931). **Poisoning by Woody Nightshade.** *Vet. Rec.* **11**. 161-162.

Woody nightshade (*Solanum dulcamara*) is a solanaceous plant which the author found to be toxic when eaten in the flowering stage by cows well advanced in pregnancy. It is noteworthy that other cattle in the same herds were not affected; this indicated either that the plant is eaten more readily at this period of gestation or that it exerts its toxic action more fully on animals in this condition. Cases of poisoning were encountered on two different farms; altogether 5 animals were affected, and 4 of them died.

The symptoms were profound stupor, stertorous respirations, tympanites, dilation of the pupils and obstinate constipation. At the *post-mortem* examination of one of the animals, stems, leaves, twigs and vestiges of the flowers were found in the rumen. No pathological lesions were observed.

Treatment was symptomatic and consisted of attempts to combat the obstinate constipation by various purgatives and by the administration of strychnine as a stimulant.

———. (1931). **Find that Two Lupins Poison Stock.** *Vet. Med.* 26. 202.

In certain pastures in Northern California, Eastern Oregon and Washington, poisoning of cattle was attributed to a species of lupin (*Lupinus caudatus*) and a botanical survey was carried out. A sample of *Lupinus laxiflorus* was tested for toxicity by the Experimental Station of the Bureau of Animal Industry at Salina, Utah, and was found to be toxic for cattle, horses and sheep. It was particularly toxic for cattle and the symptoms were similar to those of larkspur poisoning. There was marked weakness and muscular trembling and these symptoms were augmented by exertion; colic was a common feature of the illness. Sheep poisoned by the plant showed great excitability. The duration of the symptoms was from one hour to more than eight days.

PUBLIC HEALTH.

KUERSCHNER, Karl. (1931). *Massnahmen der Reichsregierung auf dem Gebiete der Rinderhaltung.* [The Policy of the Government of the Reich in Relation to the Cattle Industry.] *Münch. tierärztl. Wschr.* 82. 77-81.

This is a speech delivered by the author at a meeting of the cattle husbandry division of the German Agricultural Society. The economics of the cattle industry are discussed in general terms. An historical survey for the period 1900-1914 is followed by a short account of post-war developments. The present policy of the government of the Reich in relation to the production, import, export and distribution of beef, dairy products and pedigree and store live stock, is discussed in detail and recommendations are made that the position of German producers be strengthened by the further raising of import duties on frozen and chilled beef, on live store cattle, pedigree cattle and on dairy products.

NIKLAS. (1931). *Das ländliche Molkereiwesen in Bayern im Jahre 1929.* [A Review of the Dairying Industry in Bavaria during 1929.] *Münch. tierärztl. Wschr.* 82. 43-45. 1 table.

A statistical study by the advisor in dairying at the Ministry of Agriculture of the production and consumption of milk and dairy products manufactured in Bavaria during the year 1929.

BAIRD, P. R. (1931). **Some Diseases of Cattle transmitted to Man through Milk.** *J. Amer. Vet. Med. Ass.* 78. 500-505.

This is a general paper on the ways in which milk can be contaminated and on the effect of cold storage, pasteurisation, etc., on milk and its bacterial content.

Reference is made to tuberculosis, hæmorrhagic enteritis, certain septic conditions, mastitis and *Brucella* infections in cattle as conditions in which the milk may be infective to human beings.

RITCHIE, J. N. (1931). **Some Notes on the Clinical Examination of the Cow's Udder.** *Vet. Rec.* 11. 399-402.

This is a practical paper written from the point of view of the veterinary inspector; it is followed by a discussion by those present at the time it was read.

- GRUETTNER, F. (1931). Ueber die Anwendung von Schlundkolben bei Schlachtrindern zur Verhütung der Verunreinigung der Lunge mit Panseninhalt. [**The Use of the Probang during the Slaughter of Cattle to Prevent Contamination of the Lungs with the Contents of the Rumen.**] *Schlachthof. u. Lebensmit. Ueberwach.* 17-18. Suppl. *Deuts. tierärztl. Wschr.* 39. 4 text figs. [5 refs.]

A description of a modified type of probang made from aluminium and fitted with a central flexible steel rod. The instrument is passed *per os* into the œsophagus before the animal is stunned; the globular end completely fills the œsophagus so that material regurgitated from the rumen cannot enter the lungs. The technique which is described in detail is designed for use in countries where the lungs are sold for human food.

- LEEUWEN, W. Storm van. (1931). Die Nebelkatastrophe im Industriegebiet südlich von Lüttich. [**The Fog Catastrophe in the Industrial Regions South of Lüttich.**] *Münch. med. Wschr.* 78. 49-50.

ANNOTATION. (1931). **Fog on the Meuse.** *Lancet.* 220. 302.

HALDANE, J. S. (1931). **Atmospheric Pollution and Fogs.** *Brit. Med. J.* Feb. 28th. 366.

———. (1930). Department of Scientific and Industrial Research, Sixteenth Report. H.M. Stat. Office.

ANNOTATION. (1931). **Atmospheric Pollution.** *Brit. Med. J.* March 7th. 419.

For abstracting purposes these articles relating to atmospheric pollution may be taken together in order of biological interest.

The fog disaster in the Meuse Valley in December 1930 aroused so much press interest, associated with rumours of residual poison gas dumps around Liège and falls of Sahara sand from the sky, that the precise circumstances, as investigated on the spot by Professor Leeuwen of Leiden, are of more than scientific significance. The report of Leeuwen deals mainly with the human aspect of the disaster, but a few independent veterinary examinations led to similar conclusions. *Post-mortem* examination of animals which perished, and clinical examination of survivors, revealed the cause of fatalities as irritation of the respiratory tract followed by cardiac failure. The fog commenced on Monday, December 1st, but caused no alarm until Wednesday, December 3rd, by which time concentration of irritant gases, chiefly sulphur dioxide, had occurred in the lower atmospheric regions up to the limit of human tolerance. By Thursday the doctors were busy attending to patients, amongst whom 63 fatalities occurred within 24 hours.

The symptoms were:—violent irritation of the respiratory passages, swollen mucous membranes, rapid respiration rate and dyspnoea; with dilation of the heart, frequent pulse and cyanosis in the more serious cases. Asthmatics, bronchitics, cardiac cases and elderly people, were naturally the most severely affected, but serious cases also occurred amongst young people with a previously clean bill of health. The cause was traced to the local accumulation of poisonous atmospheric contaminants such as effluent gases from factories, normally present in the air of the neighbourhood in small amounts. Peculiar meteorological conditions involving cold low-lying valley air with absence of lateral air-currents, over a belt about 25 km. long and 2 km. broad, south of Liège, led to the creation of a clean fog and an inversion of temperature gradient, acting like a lid over stagnant air charging up with sulphur dioxide and other combustion gases. As soon as the quantities rose above the limits of human tolerance, fatalities occurred.

HALDANE, commenting in the *Brit. Med. J.* upon the observations of LEEUWEN, NOLF and FIRKETT, points out that, if a similar concentration of combustion products occurred over any large town in Britain, deaths would be numbered not by tens but by thousands. The effects both on man and animals of the sulphurous and sulphuric acids, condensed as minute aqueous droplets on solid dust nuclei in low-lying fogs, would be very severe. In a town a large amount of heat is emitted at or near ground level, which normally warms and evaporates the aqueous particles which constitute a fog and sends convection currents upwards, distributing the products of combustion over several hundred feet as a "black" overhead fog. In the Meuse tragedy, owing to the absence of the warming effects of inhabited houses and the exceptional stillness of the valley air at the time of the disaster, a stifling fog formed at breathing level. HALDANE attributes the disappearance of the low opaque irritating fogs of the last century, and their replacement by "overhead fogs," to the growing substitution of gas heating for coal. Modern gas provides smokeless heat with hardly any sulphurous

fumes; and "reasonably practical" cleansing of factory gases and combustion products from large electricity generating stations must now be conducted to the satisfaction of the Ministry of Health.

In the sixteenth report of the Department of Scientific and Industrial Research, the more general question of atmosphere pollution is considered. Observations made by various local authorities are co-ordinated by an "Atmospheric Pollution Research Committee" and a "Standing Committee of Co-operating Bodies." Domestic smoke is recognised to be the principal cause of the present smoke nuisance of the large towns. For London and Glasgow the proportion is estimated as being three-quarters domestic to one-quarter industrial. Every ton of coal consumed by the householder causes up to ten shillings worth of damage, varying with the district. Damage to buildings over the last 25 years amounts to about sixty million sterling. Sulphur is the chief sinner and a convenient apparatus for rapid detection has been devised. Smoke from densely populated areas not only affects local atmospheric cleanliness but may diminish visibility several hundred miles away. Daylight studies showed that in Sheffield in December 1929 no ultra-violet light at all was received in the middle of the city. By comparison with a point only a mile away, Rochdale loses nearly one-third of the ultra-violet rays of its daylight for half the year. This is quite a considerable health consideration.

Apparently the proper control of coal consumption is now of vital importance, apart from the economic wastage involved in old fashioned methods of combustion.

TECHNIQUE

PESCH, K. L. (1931). Das "Kolonoskop," ein Projektionsapparat für Kolonienzählung in Plattenkulturen. [**The "Kolonoskop," a New Projection Apparatus for counting Colonies on Plate Cultures.**] *Zbl. Bakt. (Orig.)* **120**. 254-256. 1 table. 5 figs.

A description of a new projection apparatus which has been recently put on the market by a German firm. The colonies on a thickly overgrown plate can be counted and even the smallest colonies can be detected. Colonies over 2μ in diameter which have a characteristic appearance can be easily picked out, counted and projected on to a screen or a white wall at 5 to 50 magnifications.

BARNES, M. F. (1931). **The Drummond Pipetting Machine.** *J. Amer. Vet. Med. Ass.* **78**. 240-241.

A brief paper giving a rather incomplete description of a machine for the mechanical measurement of liquids used in such an operation as the agglutination test. The author gives the following description of the apparatus:—

"In the Drummond machine, the valve mechanism is constructed on an entirely different principle, being a simple four-way stop-cock which is actuated at the end of the piston-stroke by a four-point-star wheel, similar in action to a motion-picture escapement. The plug of the stop-cock is of stainless steel, ground into a shell of bronze, insuring a long term of use without repair or special attention. To clean this machine, it is necessary only to lift out the syringe and remove the stop-cock plug; the complete cleaning requires but a few moments.

"The syringe is mounted vertically, tip up, and remains stationary. This makes it self-priming and precludes the possibility of air collecting therein.

"The stroke of the piston may be adjusted to deliver from 0.1 to 2.5 c.c. with a 3 c.c. syringe, and up to 4 c.c. with a 5 c.c. syringe. Once set for the proper amount, the machine will deliver precisely the same volume at the rate of approximately 60 charges per minute. The regular stock B-D Sanalol syringe is used and may be inserted, just as purchased, without alteration."

PAGOULATOS, Nikol. (1931). Ein neuer Nährboden zur Herstellung von starken Dicktoxinen. [**A New Culture-medium for the Preparation of a Potent Toxin for use in the Dick Test for Scarlet Fever.**] *Zbl. Bakt. (Orig.)* **119**. 472.

A description of a new amyl broth in which the scarlet fever streptococcus produces a more potent toxin than it does in pancreas broth; the toxin filtrate has a low animal protein content.

KUHN, M. J. (1931). Modification du procédé de Medwedeff pour des préparations anatomiques en plaques. [**Modification of Medwedeff's Method of mounting Anatomical Preparations in Plaques.**] *C.R. Soc. Biol. Paris*. **106**. 381.

The advantages of mounting specimens in a solid medium are:—they occupy less space, there is economy in material, specimens are less likely to deteriorate, examination is easier and they are more convenient for demonstration purposes. There are, however, certain difficulties in the tech-

nique of preparation. Gelatin is liable to melt in hot weather and agar which must be used hot cannot always be made perfectly transparent.

Medwedeff's method (*Zlb. f. allgem. Pathol. u. pathol. Anat.* 1929. **46**. 193-196.) is to embed the specimens in a silicious gel; glass vessels must be used for fixing, preserving, mounting, etc.

The author's modification lies in the preparation of the "plaques" for mounting the specimens. Glass plates of convenient sizes, according to the specimen, have their edges smeared with dammar resin dissolved in xylol with some zinc oxide added. The edges are sealed with this mixture and are finally bound with black gummed paper or strips of adhesive plaster which may be painted with a mixture of acetone, celluloid and animal black. Specimens so mounted are unaffected by heat. They can be shown in the epidiascope.

HOFFMANN, J. A. (1931). Desinfektion der Hände und Arme mit Dijozolseife. [**Disinfection of the Hands and Arms with Dijozol Soap**]. *Münch. tierärztl. Wschr.* **82**. 82-83. (8 refs.)

Dijozol is a chemical substance made from a concentrated alcoholic solution of a specially prepared di-iodated salt of sulphocarboic acid which contains an exceptionally large amount of ionised iodine. It is said to have a deeper action than *Tr. iodi* and it is a deodorant. Dijozol Soap is 14 per cent. sodium soap plus 86 per cent. of a mixture of dijozol and absolute alcohol. Dijozol is used as a skin disinfectant for aseptic surgery and for disinfecting the hands and arms after a preliminary cleansing with soap and water.

REPORTS

TANGANYIKA TERRITORY. (1930). **Annual Report of the Department of Veterinary Science and Animal Husbandry, 1929.** (McCALL, F. G.) 76 pp. Dar Es Salaam. Govt. Printer. [fcp.]

STAFF.—The European staff consists of 21 veterinary officers, one chief clerk, one laboratory assistant, 27 stock inspectors, one farm manager, one clerk storekeeper and one mechanic. In addition there was an Asiatic clerical staff of 6 and there were 250 African quarantine guards.

TOURING.—The members of the European staff travelled 18,701 miles on foot and 54,860 miles by motor vehicles.

DISEASE.

RINDERPEST.—The bulk of the activities of the department are directed to a campaign to eradicate rinderpest from the territory by means of control of animal movement and quarantine, combined with the use of the passive immunity conferred by anti-rinderpest serum. The disease is now restricted to certain northern areas of the territory. The period under report was a bad stock year as there was an exceptional drought.

A wave of rinderpest infection began in 1927 in the Northern Province as the result of the invasion of Kenya Masai stock. It smouldered on through 1928 and reached its maximum intensity in 1929. In consequence of the drought in the year under report, cattle had to congregate around the few permanent sources of water supply. There was some concealment of the disease by native owners.

Foci of infection were systematically dealt with and it is hoped that the disease will be eradicated from the territory before very long.

TRYPANOSOMIASIS.—A tsetse co-ordination committee was appointed in 1928. It consisted of the Director of Medical and Sanitary Services, Director of Tsetse Research and the Director of Veterinary Services, with the Chief Secretary [? Government of Tanganyika] as Chairman. The Veterinary Pathologist was seconded for the greater part of the year for further work in connection with research into problems of animal trypanosomiasis, arrangements being made for his other work to be done for him.

T. congolense and *T. vivax* occur throughout the territory. The indigenous zebus show considerable premunition and, if well cared for, do not show clinical manifestations of infection.

Mechanically transmitted infection occurs in some tsetse-free areas.

The Director of Veterinary Services is of the opinion :—

"(a) that successful stock farming cannot be carried out in what are known to be trypanosomiasis areas, for example those which abut upon tsetse zones;

"(b) that in areas where a limited amount of trypanosomiasis (presumably mechanically borne) is encountered, the safest method of dealing with an outbreak is the immediate removal from the herd of all infected animals."

"In other words treatment so far in a large percentage of cases is only palliative; it is better than nothing, but until we have a reliable means of ascertaining when an animal is infected and of eliminating the risk of error

with regard to treated cases which have apparently recovered but are still in reality disease carriers and a source of danger, I repeat that until we are in possession of such knowledge I would in commercial herds unhesitatingly advise the slaughter of all animals proved to be or have been infected."

Data concerning tsetse flies are collected. It has not yet been necessary to go to the expense of preparing a new tsetse map of the territory.

EAST COAST FEVER.—As rinderpest is eliminated, the seriousness of the situation with regard to "East Coast fever" becomes more apparent. It is possibly the cause of more deaths in the territory than any other disease.

The problem is largely a matter of cost for the construction and maintenance of dipping tanks.

CONTAGIOUS BOVINE PLEURO-PNEUMONIA.—This disease is now restricted to the Masai herds and, except on rare occasions, causes low mortality. The affected areas are quarantined; this does not cause much inconvenience to the owners; oxen are passed out for slaughter under supervision. Any serious flare up of the disease in a quarantine area is dealt with by means of the inoculation of glycerolised lymph into the tail.

"HEARTWATER" undoubtedly exists in many areas. *Amblyomma variegatum* and *A. hebraeum* are prevalent.

HORSE SICKNESS.—Much of the territory is true horse sickness country.

STREPTOTHROCOSIS is widely distributed; it mainly affects cattle but occurs also in sheep and goats.

ANTHRAX is prevalent.

MISCELLANEOUS.—Only 4 cases of clinical tuberculosis have been recorded in zebu cattle in the territory. A few sporadic cases of blackquarter were reported during the year. There was one mild outbreak of foot and mouth disease involving 351 head of cattle. Inoculable three days sickness is widespread but comparatively unimportant. Two outbreaks each of ulcerative lymphangitis and of epizootic lymphangitis were reported.

No cases of rabies have been recorded but, from its occurrence in adjacent countries, there is no reason to believe that it is non-existent.

Parasitic diseases are very important. Sarcoptic mange of sheep and goats and *Oestrus ovis* infestation are widespread. Helminthiasis in sheep, goats and calves occurs to such an extent that "to attempt the profitable farming of sheep in the greater part of the territory is tantamount to inviting disaster." *Hæmonchus*, *Trichostrongylus*, *Oesophagostomum* and *Bunostomum* are the most troublesome of the helminths.

MEAT INSPECTION.—Some meat inspection is done in the abattoirs of the more important towns and villages. Most of the rejections of carcasses are for *Cysticercus bovis* infestation. Only a very small proportion of the animals slaughtered for food, however, are inspected.

ANIMAL HUSBANDRY.

ANIMAL CENSUS.—There are 4,867,444 cattle, 2,134,596 sheep, 2,906,638 goats, 2,378 pigs, 49,887 donkeys, 74 horses, 98 mules and 20 camels.

An instance of the disastrous nature of the year is given in the case of one small section of the Masai which lost anything up to 40 per cent. of their stock from the combined ravages of starvation and disease.

The director discusses overstocking, but doubts if it exists in Tanganyika. In some parts there are immense untenanted areas of tsetse bush country while the not inconsiderable population and their herds are crowded into tsetse-free settlements.

An account is given of officially supervised stock markets and of the operations of the permit system under which inter-district trade is controlled.

The department is giving considerable attention to improvement in the export hide and skin industry; there is great room for improvement in the existing methods of marketing.

An entirely new industry in the territory is the opening of a meat factory at Mwanza. The plant can handle 50 cattle *per diem*, turning them into beef extract, edible dripping, inedible tallow, blood, bone and meat meal. In addition a small experimental canning plant has been installed and an experimental freezing and chilling unit. At the present stages of the work there is some difficulty in obtaining regular supplies of cattle.

The cattle, buffalo, goat and sheep breeding operations of the department are described.

TANGANYIKA TERRITORY. (1930). **Report on the Work of the Veterinary Laboratory, Mpwapwa.** (HORNBY, H. E.) Ann. Rep. Direct. Vet. Sci. and Anim. Husb. 1929, part III. pp. 17-54. Dar Es Salaam : Govt. Printer. [fcp.]

The work covered by this report is described under four main headings:— rinderpest research by R. L. CORNELL and S. A. EVANS; research on trypanosomiasis by H. E. HORNBY; treatment of goat scab and attempts to transmit trypanosomiasis by flies other than tsetse, by W. H. W. BAIRD; and some problems of stock feeding, by H. E. HORNBY. The bulk of the report is devoted to the second heading, dealing with trypanosomiasis research.

STAFF.—In addition to the Veterinary Pathologist there are three European veterinary officers, a farm manager and two European laboratory assistants.

ANTI-RINDERPEST SERUM.—5,891,100 c.c. were prepared during the year.

"There is a good deal of evidence now available to show that anti-rinderpest serum is of most value when used on cattle of the same type as those which yielded the serum. When it is used on cattle of another type, it may give disappointing results."

ROUTINE USE OF TARTAR EMETIC TO PREVENT THE TRANSMISSION OF TRYPANOSOMIASIS WITH RINDERPEST VIRUS.—The method which is believed to have originated in Nigeria was adopted, *i.e.* mixing one part of tartar emetic with every 20,000 parts of blood and allowing the mixture to stand for not less than an hour before inoculation. Experiments demonstrated that this treatment destroys the infectivity of *Tr. congolense* without interfering with the action of the virus.

RINDERPEST RESEARCH.

In the report for the previous year it was stated that formalised vaccine produces a far higher power of resistance than does anti-rinderpest serum, but that it was not sufficiently stable after storage for more than 14 days.

The use of formalised virulent spleen pulp was abandoned after certain trials had been made. Spleen pulp, minced and dried in a thin layer and stored, was also found to be unsuitable for a vaccine. Spleen pulp in 50 per cent. glycerol, formalised 1 : 2,500, gave good results.

RESEARCH ON TRYPANOSOMIASIS.

THE ADHESION PHENOMENON AS AN AID TO DIAGNOSIS.—When premunised cattle were inoculated with a different strain of the same species of trypanosome, there was a positive reaction to the homologous strain before inoculation. Two weeks after they were inoculated with the new strain, the reaction of the animals was still negative to the new strain. Four weeks after inoculation there was a positive reaction to the new strain. There was thus great strain specificity and the test was unsuitable for the purpose of general diagnosis.

TRANSMISSION OF INFECTION.—The infection of a small number of cattle in the absence of tsetse flies and the possibility that these odd infections are due to mechanical transmission by flies other than tsetse are discussed. Experiments carried out showed that *Stomoxys* does not readily transmit infection even in the most favourable conditions. This is an important question and needs to be investigated.

TREATMENT.—"A decided step towards the goal of a practical and efficacious cure of bovine trypanosomiasis was taken when the famous German *I. G. Farben-industrie Aktiengesellschaft* introduced the drug *Antimosan*. This product is the result of the attempts by Professor H. SCHMIDT to prepare an Antimony drug which has the parasitocidal action of Tartar Emetic without this drug's well-known disadvantages. I am unaware of the composition of Antimosan, though I think it must be similar to the drug *Sdt. 91*—also prepared by Professor Schmidt and stated by him to be Antimony-111-pyrocatechin-disulphonate of sodium—since this drug is being used in Egypt to replace Tartar Emetic in the treatment of schistosomiasis.

"In this report the word Antimosan refers to the potassium salt. As the result of further tests, carried out at Mpwapwa in particular, the manufacturers have decided to standardise veterinary 'ANTIMOSAN' as a 6.3 per cent. solution of the sodium salt. The recommended dose of this preparation is 0.2 c.c. per kilo. body weight.

"The drug should be given subcutaneously and should be administered slowly; and it should be massaged gently away from the site of injection."

It was found that a few minutes after the intravenous injection of antimosan there was a definite increase in the number of trypanosomes in smears.

"The suggested explanation is—Trypanosomes do not like large blood-vessels where they are hurled along at considerable speed. They like the quiet of capillaries, and they have the power—like leucocytes—of attaching themselves to the walls of these vessels, and the vast majority of them at any one time are thus lying quietly. In sections of tissue from infected cattle and goats I found the parasites most easily in voluntary muscle; often there were little wads of trypanosomes in muscle capillaries when they were scanty in smears of ear or jugular-blood. When Antimosan is given, some of the disturbed parasites let go their hold and are swept into the general circulation."

"I recommend that the following procedure for the treatment of bovine trypanosomiasis be adopted whenever practicable:—Treatment should be commenced as early as possible in the course of infection and should consist

of the subcutaneous administration in front of the shoulder of five doses of Antimosan, in the form of a 7 per cent. solution; with a week's interval between the doses. Each dose should consist of 40 c.c. for an average-sized native ox, i.e. one weighing about 4 cwt. Thick smears of the patient's blood should be examined at short intervals thereafter. If relapse occurs, the course of injections and its subsequent blood examinations should be repeated. A second relapse should be followed by a third course, but a third relapse calls for an increase in dose. The beast should be given a double dose, i.e., 80 c.c., and this should be repeated if, or whenever, trypanosomes re-appear. While undergoing medicinal treatment the animal must be well-fed, but, provided he is neither anæmic nor emaciated, he can be worked moderately hard.

"If Antimosan is not available, or is too expensive, one should adopt the same line of treatment, but use 25 c.c. of a 4 per cent. aqueous solution of Tartar Emetic instead of 40 c.c. of 7 per cent. Antimosan and, of course, give the injections intravenously.

"It is difficult to recommend treatment where regular examination of blood-smears is not practicable. If treatment must be given in such cases it should consist of a full course of five weekly doses, followed thereafter by twelve monthly doses, of the same size.

"It is becoming more and more obvious that as definite distinctions must be drawn between the diseases due respectively to *T. brucei*, *T. congolense* and *T. vivax* as between the parasites themselves.

"*T. brucei* differs from the other two in many ways including morphology, development in the insect host, action on the mammalian host and *in vivo* reaction to drugs. The last three properties may possibly be linked together; for the property of the trypanosome which makes it leave the alimentary tract of the tsetse, and enter the salivary gland, may be the same that makes it able to multiply freely outside the blood-vessels of the mammalian host, and this in turn may have something to do with its reaction to medicinal agents. I do not intend to write much about the pathology of *T. brucei* disease, because this is naturally receiving considerable attention from those who are working on sleeping-sickness.

"*T. vivax* is in some ways the least adaptable and, therefore, most delicate of the three trypanosomes. It completes its development in the proboscis of the tsetse; it appears to be restricted to the blood and lymph, and particularly to favour the lymph-glands, of its mammalian host; and it is easily destroyed *in vivo* by drugs. Its lack of adaptability makes it have a very restricted range of mammalian hosts; so that it cannot be maintained in any of the small laboratory animals; also, it is not easily maintained in the laboratory even in the larger domestic mammals. For this reason it is a difficult parasite to study intensively, and very little is known about the pathology of the disease due to it. Strangely, in spite of this fastidiousness or delicacy, *T. vivax* is the one which is most easily spread mechanically by flies other than tsetse, and it has been carried from Africa to South America, where it now appears to be firmly established.

"*T. congolense* is the most important of the trypanosomes affecting bovines in Africa; and it is the one to which I have given most attention. I have stated above that *T. brucei* can multiply freely outside the blood-vessels of its mammalian hosts, and I will now go further and say that it appears to prefer transudates and dialysates of blood to blood itself. Accordingly, the disease to which it gives rise is associated with œdema, keratitis, sleeping-sickness, *in utero* infection, etc. This is not the case with *T. congolense* disease."

THE TREATMENT OF SARCOPTIC MANGE IN GOATS.

This disease is very prevalent. Dipping in the ordinary dip fluids used in the dipping tanks has not been of much use. BAIRD found that a sulphur dressing, made up with oil of tar and used motor engine oil, gave good results when it was applied by hand.

ATTEMPTS TO TRANSMIT TRYPANOSOMIASIS BY FLIES OTHER THAN TSETSE.

"In his Annual Report for 1928 the Veterinary Pathologist remarks (page 21): Clinical, and some experimental, evidence in Africa has long since incriminated Tabinids as spreaders of *T. vivax* and *T. congolense* infections. The fact that the majority of investigators have failed to set up infection with *Stomoxys* does not exonerate these flies. Although it is certain that *Stomoxys* do not transmit the diseases with the same facility as the Tabanids, yet four out of five (eighty per cent.) of our adult buffaloes contracted *T. congolense* infection in 1927 in the apparent absence of all biting flies except innumerable *Stomoxys*."

"During the year under review, although later than the period covered by these experiments, another outbreak of trypanosomiasis—this time, due to *T. vivax*—occurred among the buffalo herd at Mpwapwa. The outbreak was in September, and so it is of interest to note what were the blood-sucking flies I had noted in the vicinity of the herd during the preceding months. In April *Stomoxys* were plentiful, other genera rare. In May, *Stomoxys* were still plentiful. During the first week of this month *Pangonia* made their appearance and were very troublesome for a fortnight; dwindling away again during the last week. In June, I could catch enough *Stomoxys* for experimental purposes, but they were not numerous; while July and August were almost free from every kind of blood-sucking fly. It cannot be said that the 1929 outbreak points definitely to *Stomoxys* as a transmitter, but as it points in no other direction either, the case for or against this fly is unaltered.

"It is more than twenty years since BOUFFARD put a healthy calf in company with a *T. vivax* infected calf in a fly-proof stable in the presence of forty wild *Stomoxys*. Some of these flies were observed to feed on two afternoons, and the previously healthy calf developed trypanosomiasis twelve days later. Also, in 1912, BOUET and ROUBAUD succeeded with difficulty in the direct transmission of *T. cazalbouri* (*vivax*) and *T. pecaui* (*brucei*) by means of *Stomoxys*. Since then, evidence clinical and experimental has accumulated until, today, one is certain that *Stomoxys* can transmit trypanosomiasis, but one remains uncertain as to the extent that these flies do transmit the disease. The following experiments followed the usual lines. Guinea pigs were used for the sake of convenience. Had transmission been effected between these animals, the large domestic animals would have been substituted."

BAIRD attempted to infect healthy guinea pigs by allowing *Stomoxys* to feed on them after a preliminary feed on an infected animal. Details of the experiments are given; negative results were obtained in all cases.

SOME PROBLEMS OF STOCK FEEDING.

"It has been our experience that whenever we have been able to feed a well-balanced ration of local grown produce, e.g. hay, silage, maize and beans, of sufficient starch value, together with a little common salt, our native animals developed normally without sign of deficiency of any mineral or vitamin.

"Also, when to such a ration we have added bone-meal, iodine or cod liver oil, we have not obtained any improved result.

"Also, in this district, even cattle which have to fend for themselves never seem to show osteophagia, or obvious craving for any inorganic substance other than common salt.

"Hence, I am persuaded that, so long as the vast majority of the animals are native, the problem of stock-feeding in this Territory is how to supply food of sufficient energy value; and until this is solved the question of deficiency of vitamins or of any mineral substance other than common salt may be left on one side.

"It is possible that this absence of deficiency diseases may in some way be due to the—what seems to the stock-owner, unfortunate—shortage of *grassland*; most of the vegetation of this country being *woodland*."

HORNBY made a collection of the plants at Mwapwa and noted whether they are eaten by cattle or not. He arranged for the plants to be named and gives an account of them.

SUDAN GOVERNMENT. Annual Report of the Veterinary Services. Sudan Government 1929
[KENNEDY, W.] pp. 39. [fcp].

The report is divided into 4 sections relating to diseases of animals, trade in livestock and live-stock products, improvement of livestock and miscellaneous matters. The report of the Veterinary Research Officer [BENNETT, S. C. J.] is given as an appendix but is dealt with separately in this journal.

STAFF.—In addition to the director, there are 13 British veterinary officers. The laboratory staff consists of the veterinary research officer and an assistant research officer but the latter post was vacant throughout the year.

Sudanese Arab cattle owners have, in the past, viewed with suspicion any interference with their stock by the veterinary department. They have rarely reported the occurrence of contagious diseases on account of the fear that irksome control measures would be instituted. Recent operations of the department, however, have given the stockowners confidence and they are now co-operating with the veterinary officers.

Marked success has been obtained from the use of anti-rinderpest serum and from the vaccine against contagious bovine pleuro-pneumonia.

Native councils ask that selected natives be given a training in veterinary work so that they can be sent to their respective areas and be responsible to the tribal authorities for the detection and control of outbreaks of disease.

RINDERPEST.—There were 795 outbreaks involving 124,000 cattle. 12,700 cattle died and over 37,000 were treated with serum with an average mortality of 10·25 per cent. More than half the losses were recorded in Kassala and the Fung provinces but the provinces of White Nile, Darfur and Kordofan also suffered severely.

In consequence of heavy losses during the previous year in the Butana, a common grazing ground for cattle of the Kassala and Fung provinces, arrangements were made for veterinary police to accompany the nomad arabs in their annual migrations to the Butana.

A serum laboratory will be opened at Malakal in the Upper Nile Province and it is hoped that serum will then be prepared at a low cost.

CONTAGIOUS BOVINE PLEURO-PNEUMONIA.—Although the losses from this disease were less than 12 per cent. of those due to rinderpest, stock owners rightly consider it a most serious one on account of its insidious nature and of the lengthy period over which it causes losses if left to run its natural course in a herd. There were heavy losses during the year in the Provinces of Darfur, Kassala, Kordofan and the White Nile. The heaviest losses occurred in Darfur Province where, unfortunately, the culture vaccine supplied from Khartoum could not be used in every outbreak owing to the difficulty experienced in delivering it in out-lying districts before it had lost its potency. The demand for the vaccine increases each year and it has given excellent results.

MISCELLANEOUS BOVINE DISEASES.—Foot and Mouth disease occurs in such a mild form that little notice is taken of it. No cases of anthrax have been observed during the last 3 years. *T. vivax* and *T. congolense* infection were found in cattle at Um Senebra and in Gedaref township and, according to cattle owners, about 60 per cent. of the infected cattle usually succumb to the infections. The presence of the tsetse fly has been reported by the Game Department on the Rahad River where it forms the Kassala-Fung provincial boundary (immediately south of the 13th parallel). It is suspected that other centres exist in the Fung Province.

"In Kosti township, White Nile Province, an outbreak of trypanosomiasis (*T. vivax* and *T. congolense*) occurred in November among cattle awaiting export to Egypt, and upwards of a hundred head were slaughtered in consequence. These cattle were purchased from the Seleim, Tagali, Ahamda, Shanab and Galhak districts but some of them had been in Kosti for 9 months before showing symptoms.

"In the Blue Nile Province an outbreak of trypanosomiasis came under notice in a fairly large herd of cattle at Shigeli in Makwar District."

CAMEL DISEASES.—Owing to an exceptionally heavy rainfall in the Central Sudan there was a marked increase in the number of blood-sucking flies which transmit the camel trypanosome (*T. soudanense*) and these flies extended further northward than usual. There was, in consequence, a relatively high mortality in the police and other government camels.

387 camels were treated with "Naganol"; 68 of these belonged to Sheikhs and notables who paid for the cost of the treatment.

"The histories of three camels which developed rabies in Darfur are accurately known and were as follows:—

"One camel, bitten on 23-1-29 by a dog suspected to be rabid, developed symptoms on 22-2-29 and died on 28-2-29. The other 2 camels were bitten by a dog suspected to be rabid on 26-3-29; one died on 5-5-29 and the other on 2-9-29 both showing clinical symptoms of the disease. In the 3 cases mentioned the camels' brains were forwarded to the Wellcome Tropical Research Laboratories and found to be positive to rabies."

EQUINE DISEASES.—The losses from African horse sickness were higher than usual but, in view of the rainfall, they were not abnormally heavy. Epizootic lymphangitis was responsible for the loss of 69 Government animals. Two cases of *T. brucei* and one case of *T. congolense* infection occurred.

DISEASES OF SHEEP AND GOATS.—A disease resembling South African "heartwater" was reported but there was no opportunity to investigate it. Foot rot and pleuro-pneumonia caused losses.

DISEASES OF DOGS.—"Cases of disease in dogs, suspected to be rabies, were reported from Kordofan, Upper Nile, Darfur, Red Sea, Kassala, the Fung, White Nile and Khartoum Provinces during the year and rabies was definitely diagnosed in material forwarded to the Wellcome Tropical Research Laboratories from Darfur, Kassala, White Nile and Khartoum Provinces."

Rabies must now be considered to be enzootic throughout that part of the Central Sudan lying West of the Nile and, as the disease appears to be prevalent in Abyssinia and Eritrea, there is a constant danger of its introduction to the Eastern and South-eastern Sudan.

TRADE IN LIVESTOCK AND LIVESTOCK PRODUCTS.—10,412 cattle and 15,079 sheep valued at ££84,025 were exported. At least 10,000 camels were exported. It is considered that, on an average, 14,000 camels are exported annually.

1,328 tons of hides and 1,013 tons of skins worth ££185,898 were exported. The demand for hides from abroad had been small since 1928. Details are given concerning the trade in clarified butter and meat supplies.

MISCELLANEOUS.—The operations of the department in connection with the improvement of livestock are described.

SUDAN GOVERNMENT. Annual Report of the Veterinary Research Officer, Sudan Government.
[BENNETT, S. C. J.]. Appendix to Report of the Veterinary Services, pp. 29-39. [fcp].

The laboratory is situated at Khartoum but a temporary laboratory for the production of anti-rinderpest serum was worked at Malakal in the Upper Nile Province.

The main routine work consisted of the examination of specimens submitted for diagnosis, the production of contagious bovine pleuro-pneumonia vaccine and anti-rinderpest serum, the issue of testing apparatus and "Naganol" and the collection of records in connection with the control of camel trypanosomiasis.

The routine work is so heavy that very little research work can be undertaken.

T. soudanense was diagnosed for the first time in the Sudan in a donkey. Piroplasms were observed in the blood of a giraffe and of two roan antelopes.

The following interesting observations were made in connection with piroplasmosis:—

"A case in an imported pure-bred Ayrshire bull, the interest lying in the fact that it constitutes the first occasion on which disease has in this country been ascribed to a parasite comparable with *Theileria dispar* of Northern Africa. This case is the one described in the tabulated statement of diagnoses as having *Theileria dispar*, *Piroplasma bigeminum* and *Trypanosoma theileri*, all of which appeared in less than 3 weeks from the date of importation. The first parasites to appear were *P. bigeminum* accompanied by *Tryp. theileri*, but the former was checked with a single dose of trypanblue and the trypanosome was not seen again. Three days after treatment with trypanblue, parasites of the *Theileria* type appeared and were continuously present in the blood in great numbers until death occurred on the 17th day from their first appearance. *Post-mortem* examination revealed lesions characteristic of *T. dispar*, namely, enlarged spleen and lymphatic glands, infarction of the liver (but not of the kidneys) and epicardial echymoses. "Blue bodies" were plentiful in the spleen and lymphatic glands, and were particularly numerous in preparations from the infarcted areas of the liver.

"In the absence of any precise knowledge of the distribution and species of *Theileria* in the Sudan it is not possible to estimate their possible danger to imported stock. That theileriasis, characterised by the presence of "blue bodies" exists, was established a few years ago but, seeing that all the indigenous cattle appear to be tolerant (naturally premunised) and that a negligible number of European cattle has as yet been imported, this class of infection has received practically no attention. Now, however, it is possible to state that among the local species of *Theileria* there is one that conforms closely to that named *T. dispar* in Algeria."

A CASE OF BOVINE LYMPHANGITIS WAS OBSERVED FOR THE FIRST TIME. Microscopical examination showed the presence of a branching moderately gram-positive and moderately acid-fast filamentous organism apparently in a state of purity. No further investigation has been possible as the specimen was received at the end of the year; it is, however, fairly certain the organism concerned is the common *Actinomyces farcinicus*. It was reported by the Veterinary Inspector who sent the specimen that the local cattle owners know the disease quite well; they seem not to have brought it to notice in the past because losses from it are negligible."

CONTROL OF CAMEL TRYPANOSOMIASIS (*Tr. soudanense*).

"Late in 1927 a routine system of control of camel trypanosomiasis was adopted in which the formol-gel test was to be used as the standard diagnostic test and a single dose of 10 grammes of Naganol (Bayer 205) given intravenously in aqueous solution as the standard routine treatment. It was known in instituting this method that the formol-gel test was not entirely reliable, but its accuracy was thought to be in the region of 90 per cent. Further, 10 grammes of Naganol was known to be a larger dose than would be necessary in a considerable proportion of cases; it was, however, the smallest *single* dose that had been found to cause the permanent disappearance of trypanosomes in every case treated.

"In regard to the usefulness of the formol-gel test under field conditions in the Sudan, analysis of the methods of diagnosis in the treated cases show:—

"(a) By positive microscopic findings only	11
"(b) By positive reaction to the formol-gel test only	250
"(c) By positive formol-gel reaction when microscopic examination was negative... ..	211
"(d) By positive reaction to the formol-gel test confirmed by microscopic diagnosis	47
"(e) By positive microscopic finding when reaction to the formol-gel test was negative	6

525

"In conclusion, there is now no doubt as to the certain efficacy of Naganol as a curative agent in camel trypanosomiasis; although 10 grammes is sometimes an unnecessarily large dose, it is nevertheless judged more economic to give this quantity as a routine single dose than to have a number of relapses entailing either a second treatment, or as this is often impracticable, the loss of the camels concerned. Regarding the formol-gel test as a diagnostic method, allowing for its imperfections it can be claimed that during the past 2 years in cases where it has been checked it has shown itself to be at least 4 times as useful as microscopic examination alone."

CONTAGIOUS BOVINE PLEURO-PNEUMONIA VACCINE.

"There has been no change in the technique of production; the principle throughout has been the one established as the result of experiments recorded in the Report for 1927, namely, to use cultures that have been maintained in serum peptone broth for the shortest period compatible with safety. A small preliminary experiment carried out early in 1928 (not yet published) tended to show that, with our present technique, 6 weeks in broth culture with weekly subculturings rendered the virus harmless. Owing to pressure of other work more definite work on this subject has not been possible but cultures issued as vaccine have been in the main subcultured for periods varying from 10 to 26 weeks. Actually cultures of 7, 8 and 9 weeks in artificial medium have been issued to the extent of 3,000 odd doses without ill effects (the only accidents reported have been after the use of cultures of the 10th or older generation) but owing to the incompleteness of the laboratory work it has been considered safer not to issue vaccines as near the limit of safety as those of less than 10 generations."

RINDERPEST.

The whole of the serum required is to be made at Malakal in future.

THE MERCURIC CHLORIDE TEST FOR TRYPANOSOMIASIS.

"TECHNIQUE.

"At the end of last year it was provisionally decided that a camel should be considered infected with trypanosomes if one drop of its serum added to one cubic centimetre of 1-20,000 aqueous mercuric chloride solution produces opacity within a few minutes. Possible objections to this decision are (a) that the term "one drop" may be too vague, unless a standard dropping pipette be used, and (b) that the routine use of a 1-20,000 solution of mercuric chloride may result in a certain proportion of wrong diagnoses owing to this dilution being too near to those with which the serum of some normal camels produces a precipitate. In fact it had to be decided whether for general field use it would not be better to use a 1-25,000 solution.

"Regarding the first of these, as the result of testing a large number of proved infected and non-infected camels, using drops from pipettes of varying calibres it has been found that the term 'drop' is sufficiently accurate; in fact in the first publication on the test (*J. Comp. Path.* 1928, 41, 341, ff.) it was shown that a hundred per cent. variation in the size of the drop was permissible and that the adoption of the technique of one drop to one cubic centimetre was a matter of convenience. Further, for field practice it is better to use Pasteur pipettes drawn out from small calibre glass tubing than to employ standard dropping pipettes; the former are very cheap, can be made, cleaned and sterilised in the laboratory, and can be thrown away when once used, whereas special pipettes would have to be very carefully cleaned and dried after delivering each sample of serum.

"The dilution of 1-20,000 aqueous mercuric chloride has also been confirmed by testing a large number of proved infected and non-infected camels. It has, however, been found that there is a risk of obtaining doubtful or faintly positive reactions if serum is removed from the blood clot too soon after drawing the blood sample, especially if an attempt be made to save time by centrifuging freshly clotted blood. Employing the only technique that is likely to be practicable in the field, namely, to allow the blood to clot and stand overnight, the serum being tested next day, it has been found that, of 183 non-infected camels, the serum of 2 only has given a faint opacity with the 1-20,000 dilution, and none with the 1-25,000 dilution. In a paper published earlier in the year (*J. Comp. Path.* 1929 42, 118, ff.) it was therefore recorded that in order to be certain of detecting infected camels only it would be necessary to employ the 1-25,000 dilution. There is, however, a further practical consideration, namely, the length of time required after the date of infection for the serum of an infected camel to give a precipitate with the higher dilution. As the result of observations recorded in 1928 (see this Report, 1928, p. 39) it seems that while most or possibly all infected camels react positively to the 1-20,000 dilution at the end of a fortnight, only half of them do so to the 1-25,000 dilution. Or, for practical purposes, by using the 1-20,000 dilution one may diagnose an occasional non-infected camel (probably less than 1 per cent. of the whole) as being in the early stages of infection, but by using the 1-25,000 dilution one may miss quite a number of recently infected cases. It is therefore decided that for general use the 1-20,000 solution will be used, subject always to proof (not yet complete, but strongly indicated) that in cured camels the reaction to the test returns to negative within a reasonable time.

ACCURACY.

"The above discussion on technique largely establishes the accuracy of the test. Neglecting, however, the question of the exact dilution of mercuric chloride required the broad requirement of accuracy is that only infected camels shall give definitely positive results and that all of these shall do so. The following analysis of all results obtained in the laboratory during the past 4 years suffices to settle this point.

Total camels tested of which the subsequent history is known	...	...	...	...	...	250
Positive reactors	...	...	...	...	...	69
Negative reactors	...	...	...	...	...	181

"Of the positive reactors 63 were proved infected either by finding trypanosomes in the blood or by subinoculation, and four others were assumed to be infected owing to recovery of condition after treatment with Naganol. The remaining two were known to be free from infection—the two cases discussed under the heading of technique.

"Of the negative reactors 78 were proved to be free from infection by subinoculation and all the others were assumed to be free in virtue of their subsequent history being known. Among the 78 in which subinoculation with negative results was practised were 2 camels giving a positive reaction to the formol-gel test.

"Thus, on the point of accuracy the error up-to-date has been less than one per cent.

MECHANISM OF THE TEST.

"In this Report for 1928 it was recorded that with the collaboration of Dr. E. S. Horgan, of the Wellcome Tropical Research Laboratories, blood analyses were being carried out on infected camels parallel with the mercuric chloride test. The work was completed early in 1929 and full details have been published (*J. Comp. Path.* 1929, 42, 188.) Briefly stated it was found that, with an increase in the intensity of reaction to the mercuric chloride test, the serum of infected camels showed a progressive increase in the quantity of euglobulin and a decrease in pseudoglobulin, thus behaving almost exactly as human serum in Kala-azar. It was, however, most noteworthy that infection could be detected by applying the test much earlier in the course of infection than analysis could establish an appreciable relative increase of euglobulin. With the recording of this observation it is necessary to bear in mind that, in addition to the quantitative changes detected on analysis, there may possibly be some specific qualitative changes also.

DISAPPEARANCE OF POSITIVE REACTION IN CURED CAMELS.

"From the practical standpoint it is necessary to know whether a camel, having developed a positive reaction to the mercuric chloride test as the result of trypanosome infection will, when cured, cease to react

positively within a reasonable time. If not, old cured cases may be later diagnosed as reinfected, or, if there is not complete reversion to negative reaction, it may be necessary to employ a higher dilution than 1-20,000 of mercuric chloride in routine diagnosis.

"It is impossible to keep in sufficiently close touch with many cured camels for regular periodic tests to be carried out. A few results have, however, been carried out and while not numerous enough to warrant a general conclusion, they have indicated that the serum of cured camels loses all power to produce a precipitate with the 1-20,000 dilution (12 cases only). Regarding the length of time required still less information is to hand. Only 3 cured camels have been examined weekly and in these the serum gave negative reactions 4, 6 and 10 weeks respectively after cure; of 8 others 3 were negative 45 days after cure and 5 after 276 days (the only time they were available for retest).

"For field purposes, therefore, it may be provisionally concluded that there is little chance of an old cured case being diagnosed as infected unless reinfection has occurred, especially since it is known that immunity after cure persists for a few months."

MISCELLANEOUS.

———. (1931). La Stazione Sperimentale Zooprofilattica della Sicilia et il convegno dei Veterinari provinciali dell'Isola. [The Veterinary Research Institute of Sicily and the Congress of the Provincial Veterinary Officers in the Island.] *Clin. Vet.* 54. 212-215.

Gives a description of the Institute for Veterinary Research which has been opened at Palermo and outlines the work which will be carried out. Generally speaking, the work of the institute is directed towards the control of epizootic diseases.

A meeting of provincial officers was held there on January 28th, 1931. No details of the meetings are given, but foot-and-mouth disease, contagious agalaxia, epizootic lymphangitis and the contagious diseases of pigs were discussed.

Professor MIRRI, the director, lectured on sterility in bovines.

KAMMEL. (1931). Reformvorschläge für die tierärztliche Aus-und Fortbildung. [Suggestions for the Reformation of Veterinary Pre-and Postgraduate Education.] *Tierärztl. Rdsch.* 37. 157-158, 171-173 & 188-190.

The connection between the veterinary profession and agriculture must always be much closer than that between human and veterinary medicine.

The author says that technical veterinary instruction in Germany is very good but he makes some suggestions regarding alterations in, and additions to, the veterinary curriculum. He considers that training in administration should be included.

A sharp distinction should always be drawn between elementary (undergraduate) and specialised postgraduate education. Every graduate must know the fundamentals of pure and applied science before he begins to specialise; the elementary educational scheme should not, therefore, be enlarged by the inclusion of advanced subjects. These should be taught to those graduates who intend to work in special fields. It should be obligatory for students to decide in their last year whether they wish to go into practice or to take up public health work. They should be able to choose between sections of the examination for qualification and, after passing this, should be allowed to attend further classes in their chosen subjects. Practical work should be compulsory for students before they can become eligible for a second examination which, if they pass it, should enable them to take an appointment.

Owing to financial difficulties, it is impossible for adequate specialised instruction to be given in veterinary colleges. The author, therefore, suggests that special and advanced subjects should be taught fully only by a specialist at a single veterinary college in a country, instead of according to the present method in which specialised work is dealt with by teachers of other subjects.

Travel study as a part of specialist training should be strongly encouraged, most particularly for future research workers.

The author says that the above suggestions are planned with a view to producing good practical men in each of the fields open to veterinarians. He also suggests certain alterations in the various post-graduate courses with the object of widening the scope of the facilities available for prospective candidates.